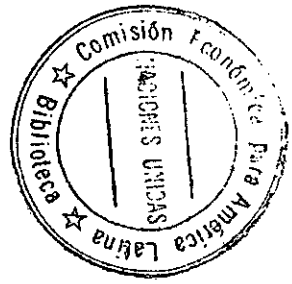
ECLA/POS 75/3
Distribution: General
Date: 10 January 1975



ECONOMIC COMMISSION FOR LATIN AMERICA
Office for the Caribbean

R E P O R T S

ON

INVENTORY OF THE PROBLEMS

OF THE

ENVIRONMENT

C O N T E N T S

INVENTORY OF THE PROBLEMS OF THE ENVIRONMENT
(UNEP/ECLA PROJECT)

Introductory Note

The main object of the project was to prepare in a short space of time a general survey of the environmental problems locally regarded as most critical; and of the institutions, policies and technical capacity of the countries in matters connected with the environment. This general survey serves as a point of departure for a more in-depth systematic knowledge of the environment, and will thus serve to identify operational projects, some of which could be implemented with the assistance of international co-operation.

The panoramic view of the situation of the environment in countries of the Caribbean was sought on the basis of the study of available data, a review of the institutions connected with this topic, and a survey of authorized opinions on the most critical problems of the environment in each country. With the collaboration of other United Nations agencies and governmental bodies, ECLA has sought in each case to present an account of the environmental problems identified, institutions and national policies connected with the environment and the installed capacity in the countries to research and solve these problems.

Work proceeded in the following stages:

(i) review of existing data;

(ii) survey of national institutions, legislation, sources of information and technical capacity of the countries as regards the environment;

(iii) consultations with national institutions and experts who may contribute data of use for the purposes of the project; and

(iv) review of the data collected and preparation of the reports.

Systematic review of existing data

Reports, monographs and publications made by the countries of the region and by some international agencies offered some available data which was systematically reviewed. The lack of data in some countries or sectors, itself constituted an important fact which was registered so as to give priority to the endeavour to fill these gaps.

Survey of Institutions

This included a description of the institutional, juridical and administrative framework and the relationship between the various administrative levels (national, provincial and municipal) as regards the protection and improvement of the environment. In addition, the effort was made to provide a brief description of the principal environment laws and their area of competence and degree of application. Whenever possible, a brief analysis was made of the degree of compatibility between legislation and environment policies and the group of social and economic development policies as a whole (for example, possible conflict between environment laws and incentives for the utilization of natural resources). Attention was given too, to existing capacity for research on environment matters (scientific and technological research councils, universities, public and private sector institutes, international agencies, etc.); and to research and training programmes on environment matters and main related branches.

Consultations

The need for obtaining an overall appreciation of the problems of the environment in the space of a few weeks made it advisable to hold consultations in the countries of the region, as a means of identifying in the shortest possible time the main environment problems as they are seen and considered by the institutions and technical experts of each country. The criteria for the selection and qualification of the problems was therefore local. Discussion of the problems of the environment were organized in each country according to its conditions, in the main restricted to selected agencies and technical experts; of national environment agencies

in the countries where these exist, of interested sectoral bodies such as national sanitation, urban development or housing agencies, or of academic institutions. The reference list of the areas in which environment problems mainly exist, annexed to this note, was the starting point for those discussions.

S. St. A. Clarke

Port of Spain
10 January 1975

Annex

Reference List

ENVIRONMENT PROBLEMS

1. HUMAN SETTLEMENTS (HABITAT)

Problems stemming from siting (owing to topography, climate, vegetation, etc.).

Problems connected with services of:

- Water supply
- Sewerage
- Collection and treatment of garbage
- Energy supply
- Community transport
- Community security (police, fire brigade)
- Communications
- Urban administration (including planning)

Housing problems (quality backlog, etc.)

Precarious settlements

Problems stemming from technology applied to the habilitation of land (clearance, urban inundations, change of climate, etc.)

Natural disasters

2. HUMAN SETTLEMENTS (HEALTH AND WELFARE)

Pollution (atmospheric, water, beaches and shorelines, food sound esthetic)

Congestion (in traffic, over-crowding, etc.)

Traffic accidents

General mortality and morbidity

Infant mortality

Deficiency in medical services (attention and prevention)

Illiteracy and deficiencies in educational and cultural media

Problems stemming from working conditions

Problems of leisure and recreation

3. EARTH, WATER AND VEGETATION

Loss of soils (by erosion, salinization, deterioration, pollution, desertification, laterization)

Deterioration of eco-systems (by destruction, poor handling, etc.)

Problems of water resources (lack of sources, pollution, changes in river beds and river systems, changes in the quality of water, losses of icthyological wealth)

Droughts and floods

Deforestation and clearance

Problems stemming from the mining of mineral products

4. OCEANS

Pollution

Fishing depredation

5. PRESERVATION OF NATURE

Plants, animals and species in danger

Destruction of parks, reservations and grazing-grounds

Destruction of genetic resources

Destruction of landscape

6. TRADE, ECONOMY AND TECHNOLOGY

Problems affecting international trade

Problems of industrial location

Problems originating in the substitution of natural products

Problems stemming from technological innovations.

B A R B A D O S

REPORT

ON

INVENTORY OF THE PROBLEMS OF THE ENVIRONMENT

IN BARBADOS

(UNEP/ECLA PROJECT)

by

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INVENTORY OF THE PROBLEMS OF THE ENVIRONMENT IN BARBADOS

(UNEP/ECLA PROJECT)

1. INTRODUCTION

1.1 The Project

A general survey of the environmental problems and inadequacies of Barbados was undertaken during the period 22-24 August 1974. The method used was the personal interview assisted by the Consultant's own experience and knowledge of the subject and the country. On three occasions, more than one official of the respective organization was present.

This survey is a part of the overall Inventory of The Problems of The Environment in Latin America being carried out by the UN Environmental Programme in collaboration with the Economic Commission for Latin America.

A List of the Persons interviewed or telephoned is at Appendix I. The absence from the island on long leave of Mr. Arthur Archer, the Senior Public Health Engineer, was regretted. Also, the lack of a PAHO/WHO Environmental Health Engineer was something of a handicap.

However, several people in Government and other posts were contacted; and there appeared to be no divergence of opinion on the island's environmental problems and inadequacies. Needless to say, more time would have been preferred, although the absence of specialized documented information and personnel throughout the entire breadth of the human environment suggests that more time would be of limited benefit.

At Appendix II, local documents used are listed.

1.2 Description of Barbados

Barbados is a typical tropical coral island in the eastern leg of the Caribbean chain of islands. It is the most easterly island (13^{0} 4' North Latitude and 50^{0} 37' West Longitude), and it has an area of 166 square miles - 21 miles long (north-south) by 14 miles at its widest point (east-west). Space, therefore, is at a premium.

Barbados is hilly, running from sea level to Mt. Hillaby at 1,104 ft. elevation. The north and east on the Atlantic side is rugged and picturesque. The west or Caribbean side is calm and smooth. The island is largely of coral formation and surrounded by miles of white sand beaches.

Rainfall averages 75 inches annually at the highest elevations and 45 inches at sea level, and the dry season is January to June. The temperature ranges around 75-80° F.

The population is estimated at 252,000 of which approximately 94,000 are in the capital, Bridgetown, and the country is one of the most densely populated areas in the world with 1,470 persons per square mile.

Barbados has a long history of British colonization - 1625 to 30 November 1966, the day of Independence. From 1639 Barbados enjoyed the right of Representative Government.

2. HUMAN SETTLEMENTS (HABITAT)

2.1 Water Supply

The general consensus is that the water supply for the island, which is all from underground sources, is both adequate and of good quality. The water is not settled or filtered, but it is chlorinated. It is supplied as follows:

		Urban	Rural
House connections	149,000 consumers	97.3%	31.5%
Easy Access	92,000	2.7%	68.5%
	241,000	100.00	100.00

The present supply of 23 MGO is nearing the estimated yield of 26 MGO. The full introduction of metering and an increase of rates are under consideration. Irrigation is generally from private wells, and bacteriological testing of water is carried out routinely by the laboratory of the Ministry of Health. (The two most senior staff of the Waterworks Department were unavailable for discussion).

2.2 Sewerage

The disposal of raw or partially treated domestic sewage into sub-soil formations and coastal waters is considered the second most urgent environmental problem in Barbados. This is especially true of the Carlisle Bay area which receives wastewater and rainfall run-off from Bridgetown and suburbs. Concern for this problem has led to government's employment of consulting engineers to carry out a feasibility study for a sewerage master plan for the south-west area. The report, which recommends a 3-phase approach, is being studied at this time; and funding possibilities are being investigated.

The practice of disposing of household sewage into "suck holes" in the ground has not yet led to any serious problems. Coastal hotels, however, sometimes dispose of raw sewage into beach and off-shore areas, thereby causing pollution problems that lead to public objections.

2.3 Refuse Disposal

It is generally accepted that the whole refuse question, including the littering of streets and public places, is the leading environmental problem in Barbados.

By an Act of 1969, the Sanitation and Cemeteries Board was empowered to:

(a) remove household refuse,

(b) clean streets,

(c) provide for the deposit on destruction of refuse,

(d) provide and maintain public baths and sanitary conveniences, and

(e) provide and maintain cemeteries.

There is general agreement by members of the Board and the Ministry of Health that the situation is unsatisfactory, with special reference to:

- poor performance and supervision of workers,
- littering and illegal dumping by the public,
- poor relationship between staff and management (of the Board),

- no security and no soil cover at disposal site where sanitary landfill inefficiently attempted,
- poor management of overall services,
- need to up-date refuse control legislation.

To take care of the refuse, which is expected to increase from 309 tons or 1,638 yds.^{3} per day in 1972-73 to 416 tons or 2,195 yds.^{3} per day in 1974-75, new regulations are being enacted, and pulverization and other equipment is to be ordered.

2.4 Planning

Planning is carried out on a national scale for new housing and industrial development areas. There is strong political control by a cabinet committee chaired by the Prime Minister. Consultation with statutory and ministerial authorities causes delays. No major problems are in evidence, and the Chief Town Planner is respected and consulted.

2.5 Housing

The high population density of Barbados is legion. However, this does not mean that multi-level living is common. Actually, mini-houses (400 ft.^{2}) on small privately owned lots (1,000-2,000 ft.^{2}) is the way of life for most low income families. These houses and the areas are therefore congested. Any attempt at urban re-development faces the legal and practical difficulty of acquiring land from a multitude of private owners and people holding "tenancies". However, there is one benefit from this heritage of privately-owned lands. There is no squatter problem in Barbados as there is in many countries (e.g. Trinidad) where suburban areas are Government-owned, and sympathies for low income families discourage strong squatter prevention measures. Housing maintenance appears to be good.

2.6 Other Problems

- Domestic Pests are not a major problem in general, except for rodents which cause tremendous damage to food-stocks etc. every year.
- Drainage problems in the flat coastal and populated areas can be embarrassing due to inadequate drains and culverts. A study has recently been carried out for the Ministry of Communications and Works.

3. HUMAN SETTLEMENTS (HEALTH AND WELFARE)

3.1 Pollution - Air, Land and Water

Air pollution from vehicular exhausts, spontaneous burning of refuse dumps, industrial chimney exhausts,... etc. is a very limited problem.

Land pollution by illegal refuse dumping is becoming quite serious, and government ministers have spoken publicly about their concern for the continued increase in all forms of this practice - from minor littering to the abandonment of derelict motor vehicles.

The lack of rivers in Barbados means that the pollution of inland waters is one of underground water. However, this is not a proven problem. The Government has very wisely had a geological survey carried out and the country has been carefully zoned for varying degrees of building restrictions and sub-surface disposal of wastewater, gas tank storage, refuse disposal,... etc.

There is a growing concern for beach and marine pollution from raw hotel wastewater, oily bilge water from passing ships (on East coast), illegal ship discharges of refuse and sewage ... etc. On bank holidays the over-population of some beaches leads to various forms of temporary pollution.

Noise pollution has not developed to any extent.

3.2 Food Sanitation

Food sanitation problems exist, especially amongst roadside vendors and small eating establishments. The problems are caused by insanitary food preparation and by improper handling by server and consumer alike. The training of Public Health Inspectors in food inspection by Project HOPE is useful, but there are simply not enough inspectors to ensure that all food handlers are properly trained and medically certified.

3.3 Environmental Education

Environmental health education is attempted on an irregular basis by a Health Education Unit in the Ministry of Health. The Unit is inactive when the lone health Educator is transferred or sick. No doubt this is one of the weaknesses of the overall health programme. Certainly, public participation in government's environmental control efforts will depend largely on an improvement in the health education work being done locally.

3.4 Health and Accident Statistics

In the attached tables at Appendix III and IV there are:

- Selected Population and Vital Statistics (1971-73)
- Summary Statistics for the years 1964 to 1973

The formerly high birth rate is now down to 21.5 (per 1,000 population) while the infant death rate has also dropped to 33.1 (per 1,000 live births). Barbados is a relatively healthy country.

3.5 Deficiencies in Governmental Services

In the Ministry of Health the basic deficiency, as reported by the Medical Officers in charge, is considered to be the lack of trained personnel in public health and environmental health, both professional and sub-professional. This is probably true of all the environment oriented services of government - this lack of trained personnel. It is equally true that the lack of a strong environmental related agency and the splintering of efforts are doing nothing for the cause of the human environment. In addition, the non-revenue earning aspect of environmental services gives them a low priority of attention.

3.6 Other Problems

- No serious problems of the working environment appear to be reportable. These are handled by the Ministry of Labour.
- In the field of leisure and recreation, the desirability of developing a large multi-purpose park has been expressed. No doubt beaches serve the people where park space is inadequate.

4. ENVIRONMENTAL RESOURCES

4.1 Soil Resources

The most important loss of soils is beach erosion. Although it varies from season to season, the east and south coasts are mostly affected (e.g. Crane Bay and Conset Bay). On the west coast, the higher cost of property makes the beach erosion threat worthy of equal attention; and it is proposed to follow up a general beach erosion study with specific solutions for specially selected areas. In some coastal areas in the south-west, deliberate sand settlement and beach reclamation have proven very feasible, even in the short term. It goes without saying that the beaches of Barbados are vital to her tourist economy; and the Parks and Beaches Commission is very conscious of this.

4.2 Water Resources

No serious problems are suffered by water resources, although the limited extent of the underground supply must be noted; and indeed, efforts to protect these sources have so far been successful. Any heavy industrialization, however, would place very embarrassing demands on this supply.

4.3 Territorial and Oceanic Waters

No major marine pollution or other problems are being experienced to threaten local fishing resources, although oil pollution of beaches, especially on the east coast, appear to be growing. This is probably due to the increase in oil tanker activity in the mid-Atlantic.

4.4 Preservation of Nature

No obvious destruction of genetic resources on landscape is taking place. Barbados' plant and animal life, if affected at all, would be due to an expanding population over her limited land space.

4.5 Other Questions

Floods are uncommon in Barbados except as flash floods in some coastal areas. Droughts occur from time to time in very dry seasons, but they are not serious. Forestry and mining work are virtually non-existent.

5. NATIONAL POLICIES AFFECTING ENVIRONMENT

5.1 Local Institutions and Legislation

No comprehensive environmental institution exists, but the following national bodies have the responsibilities as listed:

(a) Environmental Health - Ministry of Health and Welfare

(b) Parks and Beaches - Parks and Beaches Commission

(c) Refuse Collection and Disposal, - Sanitation and Cemeteries Board and Public Baths

(d) Water Supply - Water Works Department, Ministry of Communications and Works

(e) Environmental Planning - Town Planning Unit, Ministry of Finance and Planning

(f) Occupational Health - Factory Inspectorate, Ministry of Labour.

The abandonment of municipal councils in 1969 is worthy of special note.

Of all the legislation that relates to environmental control activity, the following three are worthy of special attention:

- Health Services Act of 1969 and accompanying regulations (food hygiene, refuse disposal, communicable disease control, etc.)
- Sanitation and Cemeteries Board Act, 1969-36 and accompanying regulations (refuse collection and control, public baths... etc.)
- Parks and Beaches Commission Act, 1970 and accompanying regulations (control and maintenance of parks and beaches).

5.2 Tourism and Other Industries

Without a doubt tourism is the leading industry of Barbados, whose sun-and-the-sea environment is the big attraction to foreigners. Consider the extent and growth in tourist visitors, as follows: 115,697 (1968), 134,303 (1969), 156,417 (1970), 189,075 (1971), 210,349 (1972), 222,080 (1973). In the most recent year reported (1973), the annual figure is 93% of the Barbados mid-year population estimate of 238,500. The importance of the beach and community environment to visitors is not yet apparent to the general public.

The zoning of industries is practised, and 4 or 5 such industrial areas exist. The light industries operating locally are reportedly causing no major environmental problems, and the co-ordination needed for various governmental approvals of their location, establishment... etc. is routinely practised.

5.3 International Trade

The industrialization process in Barbados is in its infancy, due possibly to the lack of cheap means of power (e.g. oil). No environmental concerns or problems are affecting industrial development on international trade.

5.4 Public and Political Attitudes

Much of Barbados' population is not conscious of the environmental aspects of the nation's life and development. No private environmental group has been formed, and the disinterest is especially true of the large low income group at the base of the population pyramid. This environmental unawareness denies such considerations a place in the on-going list of public demands; and as a result, the environment receives very little political attention. There is one exception to this, refuse control, the laws for which are now being revised and up-dated with a view to improvement and public satisfaction.

5.5 External Assistance

Barbados at present receives financial and technical assistance on a bilateral basis (e.g. U.K., Canada, U.S.A.) and a multilateral basis (e.g. UN and its specialized agencies). A possible PAHO/WHO project in environmental health is being actively considered. This would provide valuable assistance to the Ministry of Health.

6. CONCLUSION

Clearly, refuse disposal and the pollution of Carlisle Bay are the two major environmental problems in Barbados, with beach erosion following closely behind. These and other problems are listed in Appendix V - Resume of Environmental Situation.

Public complacency and political inattention are also of serious concern. Indeed, as in so many developing countries, it is going to take external influences and pressures to establish locally a true appreciation for the human environment.

ACKNOWLEDGEMENT

The assistance of the PAHO/WHO Country Representative, Dr. I. Gogan, and his staff is gratefully acknowledged. All interviews and meetings were very cordial.

Appendix I

List of Persons Interviewed in Barbados
(22-24 August 1974)

(1)	Dr. Inial Gogan	- PAHO/WHO Country Representative
(2)	Mr. J.H. Holley	- PAHO/WHO Administrative Methods Officer
(3)	Mr. D.L. Grant	- Manager, Parks and Beaches Commission
(4)	Mr. A. Lynch	- Executive Secretary, Parks and Beaches Commission
(5)	Mr. L.V. Sharpe	- Manager, Sanitation and Cemeteries Board
(6)	Mr. D. Vaughan	- Deputy Manager, Sanitation and Cemeteries Board
(7)	Mr. L. L. Reeves	- Secretary, Sanitation and Cemeteries Board
(8)	Dr. Vaughan Wells	- Chief Medical Officer, Ministry of Health and Welfare
(9)	Dr. A.W. Mearns	- Medical Officer, Ministry of Health and Welfare
(10)	Dr. F. Blackman	- Medical Officer, Ministry of Health and Welfare
(11)	Mr. L.A. Bourne	- Chief Town Planner, Ministry of Finance and Planning
(12)	Dr. F. Sander	- Director, Bellairs Research Institute of McGill University

Note: The absence from the country on long leave of the Senior Public Health Engineer (Mr. A. Archer) was regretted; and attempts to interview either the head (Mr. Sealey) or the deputy head (Mr. Rochford) of the Waterworks Department proved futile.

Appendix II

List of Reference Documents for Barbados

* (1) Barbados 1973 Guide Map (Tourist pamphlet)

* (2) Barbados - Things You Should Know (Tourist pamphlet)

* (3) Quarterly Digests of Statistics (Barbados Statistical Service)

* (4) Memo to Minister of Health and Welfare from Senior Public Health Engineer dated 25 July 1973 on subject of "Refuse Collection and Disposal in Barbados"

* (5) Report on the collection and disposal of refuse in Barbados by Senior Supervisor, Sanitation and Cemeteries Board

(6) Provisional Draft Report of Ministry of Health and Welfare for 1973 (not yet published)

* (7) Parks and Beaches Commission Act, 1970 published 31 March 1970

* (8) Parks and Beaches Regulations, 1973

* (9) Proposed Agreement for a Programme of Environmental Health and Sanitary Engineering in Barbados (PAHO/ Government of Barbados)

(10) Sanitation and Cemeteries Board Act, 1969 No. 36

(11) The Health Services (Collection and Disposal of Refuse) Regs. 1969

(12) The Health Services (Disposal of Offensive Matters) Regs, 1969

* Note: Copy submitted herewith.

Appendix III

Selected Population and Vital Statistics
1971 - 1973

Category	1971	1972	1973
Total estimated mid-year population 1/	236,400	236,000	238,500
Population under 5 years 2/			
Number	25,860	25,820	26,090
Per cent	10.9	10.9	10.9
Population 5-14 years 2/			
Number	61,750	61,640	62,300
Per cent	26.1	26.1	26.1
Females 15-44 years 2/			
Number	46,860	46,790	47,270
Per cent	19.8	19.8	19.8
Live births 3/	5,177	5,303	5,138
Birth rate (per 1,000 population) 3/	21.9	22.5	21.5
Fertility rate (number of live births per 1,000 females 15-44 years) 2/ and 3/	110.5	113.3	108.7
(Deaths registered)	2,058	2,045	2,287
(Death rate, per 1,000 population)	8.7	8.7	9.6
Deaths occurring during the year 4/		2,114	2,144
Death rate 5/ 1,000 population		8.9	9.0
Still births	99	151	91
Still birth rate per 1,000 total births 5/	18.8	27.7	17.4
Natural increase rate (per 1,000 population)	13.2	13.5	12.0
Infant deaths 4/	151	182	170
Infant death rate (per 1,000 live births)	29.2	34.3	33.1
Neonatal deaths 4/	113	144	129
Neonatal death rate (per 1,000 live births)	21.8	27.2	25.1

Category	1971	1972	1973
Deaths in children 1-4 years 4/	25	29	25
Age specific death rate in children 1-4 years (per 1,000 population)	1.2	1.4	1.2
Maternal deaths 4/	7	4	5
Maternal mortality rate (per 1,000 live births)	1.35	0.75	0.97

Notes: 1/ Mid-year population is rounded to the nearest 100.
2/ Distribution of population by age is based on the 1970 census.
3/ Live births and birth rate for 1973 are provisional.
4/ All mortality statistics and rates for 1972 and 1973, except otherwise stated are based on occurrences of deaths for these two years, and are still provisional.
5/ Still births for 1971 and 1973 are those occurring in institutions.
The 1972 figure is total number registered. This represents an improvement in the registration of still births.

Appendix IV

Summary Statistics for the Years 1964 to 1973

Year	Estimated Mid-Year Population	No. Live Births	No. Deaths Registered	Natural Increase	Birth Rate 1/	Crude Death Rate 1/	Infant Deaths	Infant Mortality Rate 2/	No. Still Births Registered	Still Birth Rate 3/	No. Maternal Deaths	Maternal Mortality Rate 2/
1964	240,000	6,506	2,127	4,379	27.1	8.7	339	52	122	1.9	9	1.4
1965	243,600	6,358	1,905	4,453	26.1	7.8	251	39	136	2.1	7	1.1
1966	245,200	6,353	2,012	4,341	25.9	8.2	303	48	99	1.6	6	0.9
1967	247,500	5,455	2,047	3,408	22.2	8.3	295	54	82	1.5	8	1.5
1968	248,600	5,474	2,045	3,429	21.8	8.1	251	46	50	0.9	15	2.7
1969	235,900	5,196	1,987	3,209	22.0	8.4	217	42	43	0.8	5	0.9
1970	237,500	4,883	2,064	2,819	20.6	8.7	224	46	56	1.1	7	1.4
1971	236,400	5,177	2,058	3,119	21.9	8.7	151	29	85	1.6	4	0.8
1972	236,000	5,303	2,045	3,258	22.5	8.7	182(a&b)	34(a&b)	151	2.8	4(a&b)	0.8(a&b)
1973	238,500	5,138(b)	2,287	2,851(b)	21.5	9.6	170(a&b)	33(a&b)	91(c)	1.7(c)	5(a&b)	1.0(a&b)

Adjusted figures based on the 1970 census.

1/ Per 1,000 estimated mid-year population
2/ Per 1,000 live births
3/ Per 100 total births

(a) Based on occurrences not registrations of deaths
(b) Provisional
(c) Number and rate based on institutional still births. Number registered not available.

Resume of Environmental Situation - BARBADOS

Capacity of Response / Major Problems	Perception	Analysis	Power of Decision	Instruments of Action		
				Legislation	Executive Organization	Human Resources
(1) HUMAN SETTLEMENTS						
(a) Refuse collection and disposal	Yes	Yes	Yes	Sanitation and Cemeteries Board Act, 1969	Sanitation and Cemeteries Board	Limited
(b) Sewerage	Yes	Yes	No	Nil	Nil	Nil
(2) ENVIRONMENTAL HEALTH						
(a) Environmental Education	No	No	No	Public Health Ordinance	Health Education Unit, Ministry of Health and Welfare	Very Limited
(b) Food Sanitation	Yes	Yes	Yes	- do -	Public Health Inspectorate, Ministry of Health and Welfare	Limited
(3) NATURAL RESOURCES						
(a) Beach erosion	Yes	No	Yes	Parks and Beaches Commission Act, 1970	Parks and Beaches Commission	Limited
(b) Groundwater preservation	Yes	Yes	Yes	Public Health and Planning Ordinances	Ministries of Health and Welfare, and Finance and Planning	Satisfactory

G U Y A N A

REPORT

ON

INVENTORY OF THE PROBLEMS OF THE ENVIRONMENT

IN GUYANA

(UNEP/ECLA PROJECT)

by

Ronald A. Williams[1]
Engineering Consultant

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INVENTORY OF THE PROBLEMS OF THE ENVIRONMENT IN GUYANA

(UNEP/ECLA PROJECT)

1. INTRODUCTION

1.1 The Project

A general survey of the environmental problems and inadequacies of Guyana was undertaken during the period 27-30 August 1974. The method used was the personal interview assisted by the Consultant's own experience and knowledge of the subject. A list of the persons interviewed is at Appendix I.

This survey is a part of the overall Inventory of the Problems of The Environment in Latin America being carried out by the UN Environmental Programme in collaboration with the Economic Commission for Latin America.

Many people in Government and other posts were interviewed, and they all expressed a similarity of opinion - some environmental problems exist, but the environment as a whole is not a national priority yet, although it will become so as the country develops.

A list of reference documents used is given at Appendix II.

1.2 Description of Guyana

Guyana lies on the north-east coast of South America between 1° and 9° North latitude and 57° and 62° West longitude. It is bordered on the north-east by the Atlantic Ocean, on the east by Surinam, on the south and south-west by Brazil, and on the north-west by Venezuela. A map of the country is shown at Appendix III.

It is 83,000 square miles in area - approximately 400 miles north-south by approximately 200 miles east-west. Despite this area (similar to England, Scotland and Wales), it has a population of only 732,000.

The country has four recognized regions from north to south as follows:

- The coastal belt maintains the bulk of the population, and much of it is under the level of high tides.

- The intermediate peneplain contains white sands that support forest cover and extensive deposits of bauxite.
- The highland is a region of high mountains and hydro-power potential.
- The savannah-land is the location of large-scale beef cattle-ranching.

Through these regions flow four major rivers - Essequibo, Berbice, Corentyne and Demerara. They flow northerly into the Atlantic Ocean.

Guyana's climate is characterised by high rainfall, high humidity and constant temperatures of 75-85°F. Rainfall varies from 50 to 140 inches a year along the coast.

Guyana's earliest recorded history is one of Spanish, Portuguese and Dutch settlers, following which it was ceded to Great Britain in 1814. Development as a British colony was under a plantation system using slaves and indentured labour.

Additional information is given at Appendix IV.

2. HUMAN SETTLEMENT (HABITAT)

2.1 Water Supply

The Georgetown Sewerage and Water Commissioners provide the Georgetown area with an adequate water supply (reportedly 75-100 gpcd) from a "conservancy" and wells. Water treatment facilities and distribution mains need expansion and replacement. In urban areas, 92 per cent are supplied, but in rural areas only 32 per cent receive intermittent supplies with insufficient pressure, no treatment and poor maintenance. In many areas water borne diseases are common.

Outside of Georgetown the Guyana Water Authority has been established (in 1972) with strong powers to control water resources throughout, to explore for water, and to control all potable water supplies. The enabling legislation is based on that of the Ontario

Water Resources Council. At present three studies are being carried out or completed with UNDP/PAHO, USA and Canadian assistance:

- Sector study on Potable Water Supply, Sewage Disposal Storm Drainage and Solid Waste Disposal (completed).
- Pre-feasibility study of the Improvement and Extension of Potable Water Supply on the Coast of Guyana.
- UNDP Studies for the improvement and extension of water supply, sewerage and drainage facilities in Georgetown, as well as of sewerage and drainage facilities for New Amsterdam and Linden.

Certain priority areas were selected and supplies to the first area from Georgetown to Timehri (the airport) are being completed. Meanwhile, works in the second area (linden) are in progress.

Present water project needs appear to be:

- Water resource investigation and study; and
- Water treatment and quality monitoring.

A metering programme is also needed to cut back on wastage.

2.2 Sewerage and Drainage

Sewer systems exist in the old centres of the cities of Georgetown and New Amsterdam; but there are no treatment facilities, disposal being out to sea. Most of the population of these urban areas that continue to expand are really served by septic tanks, with effluents draining into the everpresent surface canal. This situation is far from satisfactory, and present studies will no doubt recommend an expansion of the old sewer systems, and possibly the introduction of treatment plant facilities (at least primary treatment). It is believed that 17 per cent of the population of the country is served by septic tanks and 64 per cent by latrines, the majority of which are in poor condition.

Many drainage problems exist throughout Guyana, due largely to the low elevation of the coastal area as well as to the abundance

of well fed rivers and tributaries all over. Georgetown itself is covered with stagnant canals which receive waste water, storm run-off and even septic tank effluent, and are therefore rich in water lilies and other aquatic plant life. These canals are a haven for mosquito breeding and mosquitoes are therefore prevalent.

2.3 Refuse Disposal

There is a refuse collection service only in Georgetown where the refuse is disposed of through incineration (25%) and sanitary landfill. The incinerator is old and in need of constant repair. The landfilling has provided many areas in Georgetown for park and recreation space. Indeed, even old disused canals (e.g. northern end of the main water supply canal) may be backfilled for community use. This work is carried out by the Cleansing Department whose report for 1973 is submitted herewith. It is to be noted that the cleaning of streets and public places is also their responsibility. It is reported that the department is badly in need of collection vehicles and staff to meet the growing demands of a spreading city.

It is clear that a Solid Waste Management Study is needed for the urban areas to modernise all aspects of the collection and disposal of refuse, including public participation and staff training.

2.4 Planning

The planning process is not given adequate attention in Guyana. New communities have not been properly planned in the past, thereby causing inefficient use of land resources and leading to problems in providing infrastructural facilities, e.g. water supply, sewerage, drainage, roads, electricity, etc.

Although there is a Central Housing and Planning Authority, advised by the Town and Country Planning Department, Ministry of Housing, there is an acute shortage of Planners in Government. The result is that:

(a) there is not enough planning staff to prepare "schemes" for the country's housing and community development; and

(b) there is too little and too late consultation with the lone Town and Country Planner.

The proposed decentralization of planning authority (to municipalities) is virtually impossible without a major increase in planners and other planning personnel.

2.5 Housing

In 1972 it was estimated that 11,100 housing units would have to be constructed annually in order that the 1976 population would be satisfactorily housed. This target is not being met.

In many rural areas, housing conditions are reportedly poor, while a few urban slum areas exist. In some urban centres overcrowding of houses is prevalent. However, due to the large size of the country, Georgetown is spread out and house lots tend to be of reasonable size (5,000-10,000 square feet), so that congested areas are few and far between.

2.6 Community Sanitation

Community sanitation, especially in the rural areas, is reportedly far from satisfactory. An attempt should be made to establish a total environment approach in all rural areas, combining such aspects as: water quality control, sewage disposal inspections, drain maintenance, refuse collection, pest control, environmental health education of public, food sanitation, housing improvement, staff training, etc.

If the national aim of the interior development (by industrialization, deforestation and agriculturalization) is to take place, the planning, servicing and management of new and old rural communities will take on a new significance. In this area, external assistance would be more than welcomed.

Stray dogs in urban areas, is a problem that is tackled by the City Council on a routine basis.

2.7 Other Problems

(a) School sanitation: Some efforts are made in the more urban schools, but the true breadth of the field of school sanitation has really not been identified.

(b) Port sanitation: This is not satisfactory. Rodent control is practised, but all other aspects (e.g. inspection of imported foodstuffs, etc.) are not adequately practised, if at all.

3. HUMAN SETTLEMENTS (HEALTH AND WELFARE)

3.1 Pollution - Air, Land and Water

Air Pollution: The main example of this problem is in Bauxite Mining (e.g. GUYBAU at Linden), quarrying, and from the various chimneys (e.g. factories, power plant, incinerator, etc.). Except at Linden, where the Bauxite community is seriously affected, air pollution problems are not significant.

Land Pollution: The most serious form of land pollution is the littering and dumping of refuse that takes place in most communities. The need for environmental education of the public on this subject is agreed by all.

River Pollution: Rivers (especially the Demerara) are no doubt polluted to a small extent by adjacent communities and industries, and where navigable, by ocean-going ships. It is not too early for Guyana to take a stock of the domestic sewerage and industrial waste water entering her rivers. Waste treatment facilities are best introduced at the establishment of communities and industries rather than later on.

Marine Pollution: Guyana's coastal waters are generally muddy from the high sediment loads of her river discharges. Illegal ship discharges of solid and liquid waste are as common as elsewhere, but not a major concern. Recent marine oil exploration has not caused any known environmental problems.

3.2 Food Sanitation

Milk and meat production are significant, and poultry processing is developing. Food sanitation problems are basically one of eating places, such as:

"(a) Failure to maintain general cleanliness;
(b) Inadequate kitchen and washing facilities;
(c) Improper utensils;
(d) Poor fly and vermin protections;
(e) Use of a common towel in washroom;
(f) No medical examination of food handlers."

3.3 Environmental Education

At present environmental education falls within the responsibilities of the Health Education Unit of the Ministry of Health which has one Health Education Officer and two assistants. There is a lack of public awareness of health problems and participation in health programmes. A PAHO/WHO document suggests the weaknesses in the health education programme as:

- A shortage of trained health educators, and
- Health education programmes not properly organized except on a demand/need basis.

As in other developing countries where a low socio-economic state is enjoyed by many, the education of the public in elementary aspects of environmental control is an essential long-term effort.

3.4 Health Situation and Statistics

Deficiencies in the national health programme listed by PAHO/WHO in their four-year projections (1972-75) are:

"(a) Low priority of the health section in the overall national development policy;
(b) Poor communication facilities between areas making delivery of health services relatively difficult;
(c) Inadequate financial resources for health;

(d) Shortage of health personnel;

(e) Inequitable distribution of health personnel;

(f) Lack of awareness of health problems and poor participation in the health services of the general population;

(g) Inefficient administrative practices;

(h) Lack of good information system on health situation."

The following table gives some idea about environmental diseases:

Table - Status of Some Environmental Diseases

	CASES		Action and/or Comment
	1973	1972	
Typhoid	182	519	Immunization programme
Gastro-enteritis	629	542	Still a problem
Yellow fever	-	-	Immunization and Aedes aegpti control
Malaria	-	-	Eradicated
Filaria	7	7	Disease increasing
Diphtheria	20	16	-
Poliomyelitis	-	-	Oral polio vaccination

It should be noted that Guyana has the size, mainland location, climate and physical characteristics that suggest that health threats to her development can be harmful and should be taken seriously. In particular, such environmental diseases as cholera and schistosomiasis, which have the right conditions for development and proliferation, can hurt Guyana's progress if they appear.

3.5 Deficiencies in Governmental Services

As in so many developing countries, major deficiencies in the overall Government Services affecting a possible national environmental programme are:

- Low priority for non-revenue producing services (e.g. public health, environmental sanitation, etc.)

- Inadequate financial resources for marked progress in all areas of national development
- Shortage of trained manpower at all levels
- Lack of recorded information.

In recent years, there has been a heavy emigration of trained nationals to North America and elsewhere.

3.6 Other Problems

Working Environment: According to the Ministry of Health "there is no programme of industrial health being carried out by the Ministry of Health or the Ministry of Labour." There appears to be a shortage of trained staff to pursue statutory responsibilities.

4. ENVIRONMENTAL RESOURCES

4.1 Soil Resources

Because of the nature of Guyana's lands, it appears at first that soil losses are not a problem. On the coast there is silting up at the mouths of her four big rivers. In the interior there is no wind erosion due to the heavy tree cover in most parts, and main water erosion is confined to the bauxite areas. However, "the entire coastline of Guyana lies below high tide level and is liable not only to inundation and erosion by sea in front but also the flooding by run-off from the hilly behind ..... The coastline is subject to a cyclic erosion and accretion which recurs at any given location at an interval of about thirty years. Each cycle has resulted in a net erosion of foreshore thus undermining and exposing the existing defences." Hence sea defence work is of national importance. Reclamation is also carried out.

Some little salinization occurs when a coastal area is flooded by the tidal stretch of the adjacent river.

4.2 Water Resources

Among other things, the Hydrometeorological Service of Guyana is charged with:

(a) A continuous inventory of surface and ground resources;

(b) Constant and continuous surveillance of the quality of the water in streams and rivers.

Surface water is being measured to the extent of 25% for coastal streams and 40% for hinterland streams; and groundwater investigations and reconnaissance are taking place.

There is as yet no serious competition for water resources between the community, agriculture and industry, and water pollution is minimal in developed areas.

4.3 Deforestation

Tropical rain forest covers 85 per cent of the land area, the more accessible parts of which are lightly exploited for greenheart, wallaba and crabwood. Seventy licensed sawmills operate throughout. It is planned to increase forestry exploitation and the manufacture of forest products, as well as the reforestation of some areas and the use of others for agricultural development.

At present no deforestation problems occur due to natural re-growth and the re-planting programme. Forestry fires are not a serious problem. For the time being, Guyana's huge forests are very under-exploited.

4.4 Mining

The mining of bauxite, the processing of a portion of it into alumina, and the export of both, are the main mining and mineral activities. Most of these operations are by the Government-owned Guyana Bauxite Company (GUYBAU) at Linden, and they all account for about one-fifth of both GDP and Gross domestic investment.

A copy of a GUYBAU paper on "Some Effects of the Bauxite Industry, in particular GUYBAU, on the deterioration of its environs" is submitted with this report. A summary of environmental problems is given at Appendix V.

A research programme is being set up by GUYBAU (with Batelle Research) in order to reclaim valuable by-products from the plant's wastewater. Similarly, electrostatic precipitators on chimneys are expected to severely reduce air pollution on GUYBAU's community.

The mining of gold and diamonds in rivers of the interior affect aquatic life by pollution and the physical change brought about by the pumping measures used. Quarrying is also carried out, but limited areas are affected by air pollution and landscape scarring.

4.5 Hydropower Projects

Hydroelectric power possibilities exist in many areas of Guyana's interior, but the small size of the market has not encouraged such developments in the past. A UNDP Survey project is now underway and the ecological aspects will be considered in the Spring of 1975. No doubt these will include:

- upstream flooding of plant and animal wild-life
- removal of indigenous Indian communities
- downstream erosion and flow changes (quality and quantity)
- construction noise and activity alien to the area
- access road changes to the area's environment
- continuation of permanent community from construction camp.

A potential project on the Mazaruni, a tributary of the Essequibo River, is already being talked about.

4.6 Fisheries

The coast of Guyana faces the northern part of the large continental shelf area which extends along the north-eastern coast of South America from the Amazon to Trinidad. Support is provided for a relatively abundant marine life and the shrimp and sea fishing industries are developing. Foreign interests are particularly involved in shrimping. No environmental problems appear to be present at this time. No doubt it would take major changes to the outflows of all the large rivers in the area to affect the marine resources.

For inland fisheries, the catching and export of exotic fish for aquaria is practised, virtually undisturbed.

5. NATIONAL POLICIES AFFECTING ENVIRONMENT

5.1 Local Institutions and Responsibilities

There is no comprehensive environmental institution of Government, but the following agencies have the responsibilities as listed:

(a) Georgetown City Council - environmental sanitation and refuse disposal in Greater Georgetown;

(b) Georgetown Sewerage and Water Commissioners - Water supply and sewerage in Greater Georgetown;

(c) Ministry of Health - environmental sanitation, health education, mosquito control in Guyana;

(d) Guyana Water Authority - water resources control, water supply, sewerage and drainage in Guyana;

(e) Ministry of Labour - working environment;

(f) Central Housing and Planning Authority - housing;

(g) Ministry of Housing - town and country planning;

(h) Ministry of Works and Communications - sea coast protection.

5.2 Industry, Agriculture and Trade

Guyana is not yet an industrialized country. Except for bauxite and sugar, industries are light (e.g. beverage, garment, etc.). However, there is talk of such major industries as pulp and paper, cotton textile mills, glass, etc. If the present liberal approach to industrial waste disposal continues, river pollution is bound to get serious. In addition, all the plans to build industrial establishments should be accompanied by proper community development plans, especially in areas distant from the urban centres. If industrial communities are allowed to grow without adequate environmental planning, the situation will be regretted in years to come.

In agriculture, livestock development is being actively encouraged, while sugar and rice are the principal crops. Sugar production exceeds 300,000 tons annually and rice about 150,000 tons annually. Grazing, mostly for cattle, is carried out on the coastlands and on the savannahs in the interior. Plans for agricultural expansion are adversely affected by poor drainage and irrigation facilities, as well as inadequate transportation systems.

Trade policies are aimed at: (a) ensuring that the country can pay for what it buys; (b) regional integration; (c) new links, with non-traditional trading partners; and (d) encouraging local production. As yet, there is no conflict between trade and environmental considerations.

5.3 Manpower and Training

As in other fields in Government there is a manpower shortage in the environment oriented services (e.g. water supply, environmental health, etc.) at all levels. It is obvious that the development of a national environmental control programme will depend heavily on the training of enough professional and sub-professional environmentalists to staff the relevant departments and agencies.

The routine (every other year) training of public health inspectors provides the personnel for the environmental sanitation services of the Ministry of Health. However, other technician-level personnel in allied fields are not being trained in adequate numbers, if at all.

At a more senior level a course in public health engineering leading to a Bachelor of Technology was offered at the University of Guyana for one academic year starting October 1972. Courses were offered in: Sanitary Biology, Elements of Public Health, Environmental Sanitation, Introduction to Biostatistics and Statistical Decision, Groundwater Development, Hydrology, Water Supply, Sewage and Wastewater Treatment, Sanitary Engineering Laboratory, Water Plant Design, Wastewater Plant Design, Environmental Health Administration and Chemistry for Sanitary Engineering. The 16 graduates are being utilized by the Guyana Water Authority.

5.4 Public and Political Attitudes

As is customary in all developing countries where socio-economic conditions are low, the human environment is not the subject of much public interest or attention. What public demands there may be are for jobs, and the public ownership that appear to promise more material wealth for all in the long term. In such circumstances the environment takes a back seat.

The country's development programmes are aimed at the diversification and increased efficiency of agriculture, and the expansion of the industrial sector. The Government is constantly searching for projects to reduce: (a) the large body of unemployed, and (b) the economy's dependence on external influences. Guyanese nationals are also being involved in every aspect of economic development.

5.5 External Assistance

The coordination of international assistance is the responsibility of the Ministry of Economic Development where a Foreign Aid Unit exists. Both financial and technical assistance are provided by the following countries and organizations in accordance with Government's assignment of priorities:

Bilateral	-	Canada, Federal Republic of Germany, India Israel, People's Republic of China, United Kingdom, USA, Yugoslavia
Multilateral	-	UN Development Programme, PAHO/World Health Organization, World Bank
Voluntary Organizations	-	British Council, Volunteers for Service Overseas (UK), Canadian University Service Overseas

6. CONCLUSIONS

Guyana is a large tropical developing country where environmental control services are primitive and inadequate. The approach to the environment is going to have to mature in years to come to cope with the industrialization, the agricultural development, the hydroelectric power, and all other aspects of national development. Otherwise, the country is liable to suffer from a broad spectrum of environmental problems in her old coastal areas as well as in her newly developing lands in the interior. A Resume of the Environmental Situation is given in Appendix VI.

ACKNOWLEDGEMENT

The assistance of the Acting UNDP Resident Representative (Mr. T. Niwa) and his staff is gratefully acknowledged. Also, due to the efforts of Mr. P. Dial and Miss S. Mittleholzer of the Ministry of Economic Development, a great many interviews and consultations became possible.

Appendix I

List of Persons Interviewed in Guyana

(27-30 August 1974)

(1)	Mr. T. Niwa	- Acting Resident Representative, UNDP Office
(2)	Mr. J.S.M. Worrell	- Permanent Secretary, Ministry of Economic Development
(3)	Mr. A.D. Augustin	- Chief Planning Officer Ministry of Economic Development
(4)	Mr. P. Dial	- Principal Assistant Secretary, Foreign Aid Unit Ministry of Economic Development
(5)	Miss S. Mittleholzer	- Assistant Secretary Foreign Aid Unit Ministry of Economic Development
(6)	Mr. K.S. Williams	- Permanent Secretary Ministry of Labour
(7)	Mr. A. Price	- Chief Factories Officer Ministry of Labour
(8)	Mr. D. Chase	- Deputy General Manager Small Industries Corporation
(9)	Dr. D. Irvine	- Vice Chancellor University of Guyana, and Chairman National Scientific Advisory Council
(10)	Mr. J. Richardson	- Acting Chief Engineer Georgetown Sewerage and Water Commission
(11)	Mr. W.O. Orderson	- Cleansing Officer Georgetown City Council
(12)	Hon. S.S. Naraine	- Minister of Housing
(13)	Mr. G. Marshall	- Permanent Secretary Ministry of Housing
(14)	Mr. V.S. Allen	- Town and Country Planning Officer Ministry of Housing
(15)	Dr. U.P. Gibson	- General Manager Guyana Water Authority

(16) Dr. D. Marchant - Principal Medical Officer
Ministry of Health

(17) Miss E. Harding - Acting PAHO/WHO Country Representative
(Nursing Adviser)

(18) Mr. C. John - Conservator of Forests
Ministry of Energy and Natural Resources

(19) Mr. D.H. Persram - Deputy Conservator of Forests
Ministry of Energy and Natural Resources

(20) Mr. V.B. Smith - Services Coordinator
Guyana Bauxite Company Ltd. (GUYBAU)

(21) Mr. K.G. Brittain - Consulting Engineer,
Montreal Engineering Company Ltd.
UNDP Project, Hydropower Division
Ministry of Works and Communications

Appendix II

List of Reference Documents for Guyana

(1) UNDP Living Conditions in Guyana (1971)

(2) UNDP Background Paper - Country Programming (1972-1976) for the Cooperative Republic of Guyana

(3) PAHO/WHO Sector Study Report on Potable Water Supply, Sewage Disposal, Storm Drainage and Solid Waste Disposal (1974)

(4) "Environmental Factors" Extract from National Health Plan (1972-1976) of Ministry of Health

(5) Report of the Cleansing Department of the Georgetown City Council for 1973

(6) Guyana Bauxite Company Limited Report - Some Effects of the Bauxite Industry (in particular GUYBAU) on the deterioration of its environs - June 1974

(7) A Proposal for a Course Structure Leading to the Bachelor of Technology in Public Health Engineering, University of Guyana (March 1972)

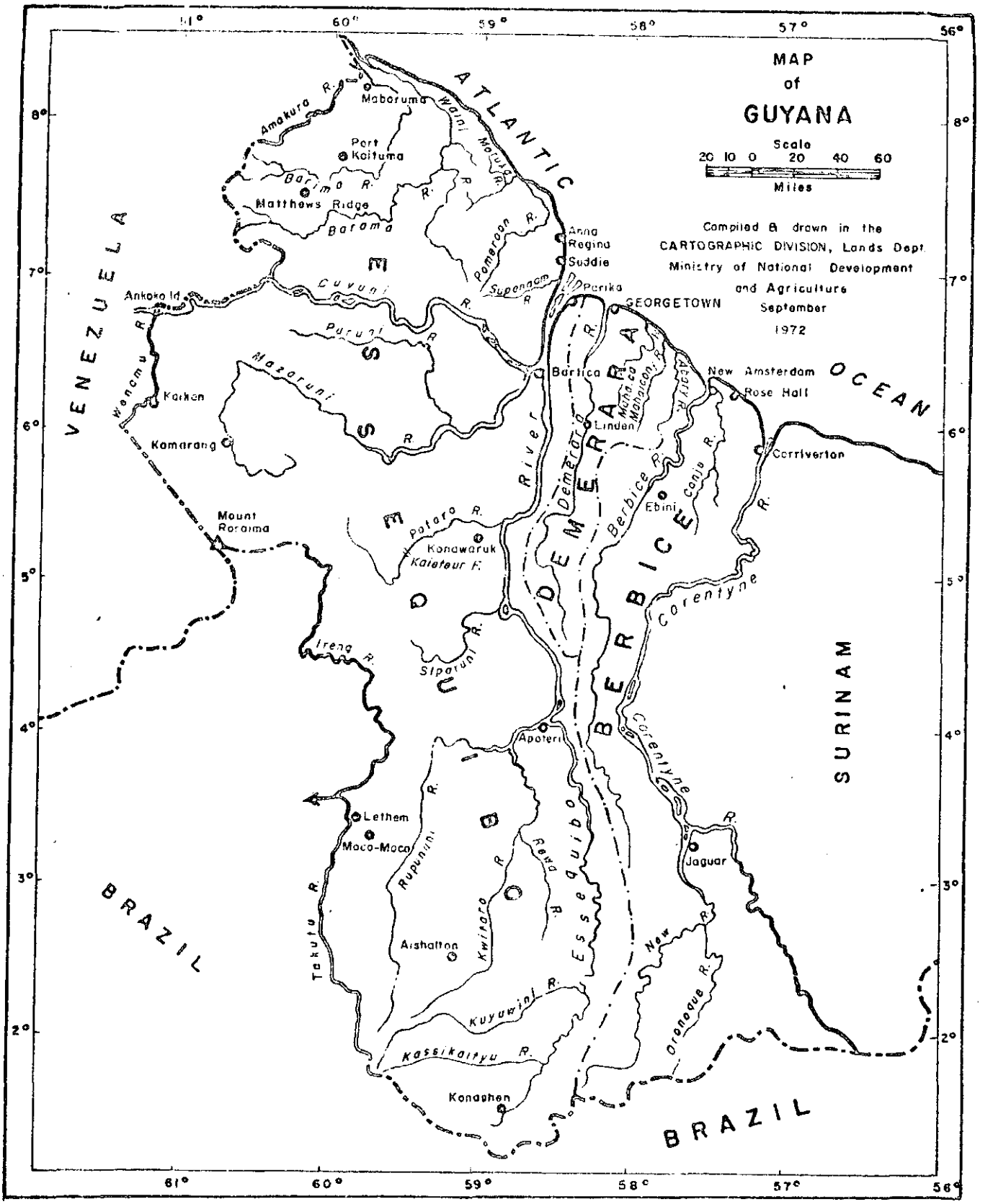
(8) Draft of Preventive Health Service Report for 1973 in Ministry of Health, Guyana

(9) Extract from PAHO/WHO Report on Health and Health Projects (1970-1980)

(10) Extract from UNEP communication on "Land, Water and Desertification"

Note: All the above documents submitted with this Report.

APPENDIX III



Basic Data About Guyana (1971)*

Area :	83,000 square miles
Population :	732,000
Political Status :	Cooperative Republic as of 23 February 1970
Gross National Product :	US$265 M
Per Capita GNP :	US$362
External Public Debt :	US$126.2 M
Merchandise Imports (cif) :	US$132.5 M
Merchandise Exports (fob) :	US$142.5 M
Government Current Expenditures:	US$68.7 M
Government Current Revenue :	US$62.5 M
Government Capital Expenditures :	US$27.5 M
Birth Rate:	38 per thousand
Population Growth Rate :	2.5% per annum
Infant Mortality :	38.3 per thousand live births
Life Expectancy :	67 years
Literacy Rate :	83% of adult population
Physicians per 10,000 :	Approximately 5

* UNDP Background Paper - Country Programming for Guyana (October 1972)

Extract from GUYBAU Paper of 24 June 1974

The effects of the bauxite industry, in particular, GUYBAU, on the deterioration of the environs may thus be summarised as follows:

1. The changing of the topography in the mining areas since the bauxite ore is reached at depths up to 200 feet. As there is no reclamation plan, new hills and artificial lakes are created. Road networks change as mining progresses.
2. Streams and the river are polluted to some extent from effluents and discharges from the mines and the plants.
3. Bauxite and alumina dust causes a nuisance problem to residents.
4. Oil spillages from the plants and ships contaminate the river.
5. There is some erosion of river banks from bauxite and alumina-carrying vessels.
6. Bauxite ore blasting causes vibration of homes.
7. Chemical contamination of the river and creeks is not significant because of the volume entering the river and creek.

Resume of Environmental Situation - GUYANA

Capacity of Response / Major Problems	Perception	Analysis	Power of Decision	Instruments of Action		
				Legislation	Executive Organization	Human Resources
(1) HUMAN SETTLEMENTS						
(a) Sewerage	Yes	Partly	Yes	Guyana Water Authority Act, 1972	Guyana Water Authority	Nil
(b) Drainage	Yes	Partly	Yes	-	Ministry of Works & Communication	Limited
(c) Refuse Disposal	No	No	Yes	Public Health Ordinance	Municipalities	Limited
(d) Water Quality	No	No	Yes	Guyana Water Authority Act, 1972	Georgetown Sewerage & Water Commissioners/Guyana Water Authority	Limited
(e) Community Sanitation	No	No	Yes	Public Health Ordinance	Ministry of Health	Limited
(2) ENVIRONMENTAL HEALTH						
(a) Environmental Disease Control	Yes	Yes	Yes	Public Health Ordinance	Ministry of Health	Limited
(b) Environmental Education	No	No	Yes	Public Health Ordinance	Health Education Unit, Ministry of Health	Very Limited
(3) NATURAL RESOURCES						
(a) Lack of resource information	No	No	Yes	n.a.	Ministry of Energy & Natural Resources	Nil
(b) Seacoast erosion	Yes	Yes	Yes	n.a.	Ministry of Works & Communication	Adequate

T R I N I D A D

&

T O B A G O

REPORT

ON

INVENTORY OF THE PROBLEMS OF THE ENVIRONMENT IN TRINIDAD & TOBAGO

(UNEP/ECLA PROJECT)

by

Ronald A. Williams [1]
Engineering Consultant

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INVENTORY OF THE PROBLEMS OF THE ENVIRONMENT IN TRINIDAD & TOBAGO

(UNEP/ECLA PROJECT)

1. INTRODUCTION

1.1 The Project

A general survey of the environmental problems and inadequacies of Trinidad & Tobago was undertaken during the period 9-11 September 1974. A List of the Persons in recent contact with the Consultant is at Appendix I. However, much of the following report is based on the Consultant's own knowledge of his home country (Trinidad & Tobago) and his experience in the environmental field, both at home and abroad.

This survey is a part of the overall Inventory of The Problems of The Environment in Latin America being carried out by the UN Environment Programme in collaboration with the Economic Commission for Latin America.

Many people in governmental and other posts who were interviewed or who are known to the Consultant all express a concern for the environmental problems and inadequacies that do exist and that will inevitably grow as the country develops.

A List of reference documents used is given at Appendix II.

1.2 Description of Trinidad & Tobago

Trinidad & Tobago is a 2-island State in the Caribbean lying at the north-eastern corner of Venezuela. Trinidad itself, the most southerly link in the Caribbean chain of islands, is located at 10° 30' North Latitude and 61° 45' West Longitude; and Tobago is located 22 miles to the north-east.

Trinidad is 1,864 sq. miles in area, and about 50 miles north-south by 37 miles east-west. Its flora, fauna and geological structure are similar to those of the Orinoco region of South America. Its green surface offers a variety of scenes - forested hills in the north, well-cultivated plains elsewhere, and numerous rivers and streams. The population was 905,930 in 1970.

Tobago is 116 sq. miles in area, and about 26 miles long by $7\frac{1}{2}$ miles at its greatest breadth. The island is of volcanic origin surrounded by attractive beaches and much cleaner coastal waters than Trinidad's. The population was 39,280 in 1970.

The dry season is January to May and the average annual rainfall is around 80 inches. The average annual temperature is about 76° F.

The capital is Port of Spain in the north-west, and Trinidad is most noted for its oil resources and a fun loving way of life. After years of British colonization the 2-island state became independent on 31 August 1962. Appendix III gives some basic data of the country, and a graph of population projections is at Appendix IV. Unless otherwise mentioned, all references in this report are to the larger island of Trinidad.

2. HUMAN SETTLEMENTS (HABITAT)

2.1 Water Supply

The first comprehensive programme of development of the water resources of Trinidad & Tobago was established in 1950, when 15 mgd was being supplied to a population of 620,000. From 1953 to 1965 production was increased from 16 mgd to 47 mgd. In the latter year, the Water and Sewerage Authority was formed by amalgamating six water authorities. In 1970 engineering consultants submitted a report on the entire subject entitled "Trinidad & Tobago Water Study".

At present there are 60 separate water supply systems supplying 60 mgd as follows:

Surface - 22 mgd (most from Navet in the south and Hollis in the north)

Groundwater - 30 mgd (most from Northern Valleys and Alluvial Fan in the north)

The types and numbers of water services are:

Direct Connections	115,000	500,000
Stand Pipes	5,200	470,000
Truck-borne	-	30,000
Total	120,000	1,000,000
	Services	Population

Waste and loss are considered high, and together with fire-fighting, vary between 5-50% as "unaccounted-for" water. Water quality is well controlled, but supplies to both the greater Port of Spain area in the north and San Fernando in the south are inadequate. The expansion of Navet with a new low dam will provide 7 mgd more to the south in 1976, while the Caroni-Arima project due for completion in 1980 will provide 60 mgd to the north and south.

Due to oil price increases and, as a consequence, a rise in national revenue, Trinidad plans some heavy investment into industry in the Point Lisas area. The real constraint to that development is water supply to meet the industrial needs of 63 mgd in 1980 and thereafter. (See Appendix V for Water Supply Information).

2.2 Sewerage

During the years 1962-65 Government undertook an island-wide sewerage project which involved sewers and treatment plants for Port of Spain (sewage lagoons), San Fernando (trickling filter) and Arima (trickling filter). Detailed information on this subject has been submitted with this report.

In other smaller communities and for some institutions, small sewerage systems exist. Trincity, between Port of Spain and the airport, is an example of this. Outside of these areas the homes are served with septic tanks and soakaway pits, while rural homes without a pipe-borne supply use the pit privy. (An anti-hookworm privy programme by Government has been relatively successful).

There is a need for an expansion of sewerage facilities and an improvement in their maintenance and operation. The Port of Spain sewage lagoons for instance, are badly in need of desludging.

Although some industrial wastewater is received in the sewerage systems, much remains to be done in this area when they are expanded. The whole question of industrial waste disposal, especially for old industries, remains somewhat unconsidered as the country's waterways become more polluted.

2.3 Drainage

In a country with a high annual rainfall in the north where most of the population lives, drainage problems do exist and they can be acute. The run-off from the northern range of hills has to cross major roads (e.g. Eastern Main Road) to join watercourses to run to sea. Due to housing development on higher ground many drains and culverts are no longer adequate, and flash flooding of various roads (e.g. Saddle Road to Maraval) is not uncommon.

Almost as serious, is the lack of drain, canal and river maintenance. The responsibility falls on the shoulders of more than one authority (e.g. County Councils and Ministry of Works) and this causes confusion. In addition, budgets and manpower are totally inadequate.

2.4 Refuse Disposal

Refuse collection and disposal are local government responsibilities. Collection for most neighbourhoods is three times a week. The major problem is in central Port of Spain where "dust-bins" are routinely spilled by stray dogs before early morning collection crews arrive. In some areas where collection is by contractor, there are instances of unsatisfactory collection or transportation.

But the real problem is in disposal. Throughout the country disposal is by dumping or land-filling. Because of the lack of soil cover and organized procedures, the method is not sanitary. Spontaneous combustion also leads to constant fires; and between the odours and the smoke, downwind of these disposal areas is heavily air-polluted. The worst example is the Beetham Housing Project in eastern Port of Spain, downwind of the disposal area which is south of the Beetham Highway in the Laventille Swamp.

Public place cleaning leaves a lot to be desired. In the dry season more street washing needs to be done while the maintenance of parks and other places should be intensified.

There is a serious need for an up-to-date professional study of soild waste management throughout the country, from waste generation to disposal.

2.5 Town and Country Planning

The Town and Country Planning Department in the Ministry of Planning and Development is strong and relatively well staffed. In 1971 as many as 2,865 plans for new buildings were approved, most of these being dwelling houses.

A Master Plan for the country exists and building zones for residences, industry, etc. are clearly indicated, thus forming the basis for site approval. A new document under consideration is entitled "Planning for Development: The National Framework".

However, squatters' houses continue to mushroom throughout the hilly areas of the urban belt stretching 30 miles from Chaguaramas (west of Port of Spain) to Arima in the east all along the foothills of the state-owned northern mountain range. These squatter areas, although gradually supplied with electricity and water, generally lack the roads, drainage, sewerage and physical layout desirable for the average community. Of course, the houses themselves are unapproved by any authority.

The oldest of such areas, the slums of Laventille in east Port of Spain, is being re-planned and re-developed by the Urban Re-development Council. However, unless more modest housing can be provided for the growing population there will soon be many areas requiring re-planning and the provision of comprehensive infrastructural works and services.

2.6 Housing

While the Ministry of Housing is the controlling body over housing, a National Housing Authority exists to step up the development of Low Cost Housing Schemes to meet the growing demands of the population. Many middle and upper-income houses continue to be built by their owners on freehold land in suburban areas.

Meanwhile, applications for new houses and other buildings are considered by public health inspectors in accordance with the environmental health regulations for building sanitation.

2.7 Community Sanitation

Community sanitation does not appear to be receiving the same measure of attention as before, due probably to the failure of local government councils to modernize their approach and to expand their staff and facilities to meet the continuing increase in population and buildings. The inspection of residential property and other field activities of public health inspectors appear to be sacrificed for office approvals of house applications, etc.

The cleaning of public places is regular but not often enough, and official pest control measures are limited to aedes aegypti mosquito control work. In the overall effort at community sanitation, a much more professional approach will be needed in the future. Certainly a new appreciation for the community environment and an up-graded effort are long overdue. It is time that the inherited colonial attitude, that the community belongs to somebody else, be replaced by a new sense of civic pride.

2.8 Development Projects

South-West Tobago: The south-west end of Tobago, with the airport, some hotel development, and the tourist attraction of Buccoo Reef, has been recognized as an ecologically sensitive area requiring the highest quality of environmental planning. Development is going ahead but wastewater outlets are not being permitted to the Buccoo Reef area. The proposed sewage treatment plant will outlet off the south coast.

Point Lisas Industrial Port: An industrial port is proposed for the Point Lisas area near Couva on the west coast of Trinidad towards the south. Plans are for separate but common sewerage and industrial waste systems. Strict control is going to be needed to prevent environmental pollution by the major industries planned for the area.

Chaguaramas Development Project: A Chaguaramas Development Authority was formed in 1972 to develop the entire north-west peninsula of Trinidad. The development project is expected to include residential areas, commercial area, hotel development, and some light and marine-oriented industries. Recreational areas, including a national park, are also proposed. At a public enquiry into the developmental plans for the area, a considerable interest was shown in environmental preservation and protection. Such considerations are essential to the long term tourist (local and foreign) benefits from the development of the peninsula.

2.9 Other Problems

School Sanitation: In general, overcrowding, poor lighting and ventilation, inadequate sanitary facilities, and lack of a rigid house-keeping schedule are the main school environment problems. There is no recognized School Environment Programme, and most school environments do not receive the specialized and consistent attention they deserve.

Port Sanitation: Sanitation at the seaport of Port of Spain could be improved. There is no possible connection between ships and the local sewer system, so that ships' sewage is routinely discharged into the port's waters. The collection of solid waste from the area is not always prompt, and improper storage of goods (covered and in the open) only allows the rodent problem to continue unabated. A shortage of sanitary facilities is yet another weakness. Meanwhile, airport sanitation is satisfactory, although there is the dumping of refuse from planes and hotels on the banks of the Caroni River.

3. HUMAN SETTLEMENTS (HEALTH AND WELFARE)

3.1 Environmental Pollution

Trinidad's interest in its growing industrial pollution dates back many years. In 1958 a committee was appointed "to examine the problems of the pollution of rivers, inland and coastal waters and

agricultural land by oil, sewage and effluent from factories and mills, and to recommend such measures of control as may be necessary in the overall interests of Trinidad & Tobago". The Committee reported in 1960 that "at present the pollution nuisance has not reached substantial proportions". However, they warned that "immediate steps must be taken to initiate schemes whereby pollution is controlled and minimised" in view of the continuing industrial and housing developments in the country.

The Committee's work led to the island-wide sewerage scheme of 1962 to 1965. Then in 1970 a similar committee was again formed and found that there was enough pollution from oil and other causes to warrant legislative and other action by the government and the major industries.

In 1972 another committee was appointed "to consider the problems posed by industrial wastes in Trinidad & Tobago". Wastes from the following local industries were considered problematic: sugar, rum distillery, cement, petroleum, quarrying, bakeries, laundries, bauxite transfer, etc.

More recently (in 1973) an Anti-Pollution Council was formed and its interim report recommends a strong and broad environmental control programme to combat pollution and other problems. Its terms of reference and membership are given at Appendix VI.

It is clear that all forms of environmental pollution exist in Trinidad (not Tobago) and have been brought to the attention of the policymakers. However, no concrete action appears to have been taken. No detailed information exists and the country is without modern anti-pollution legislation, standards and enforcement capability.

3.1.1 Air Pollution

Air pollution exists in Trinidad from the following:

- Smoke, gases and other atmospheric discharges from oil, petro-chemicals, cement, sugar, garment and other industrial establishments.

- Sugar-cane and refuse-dump burning.
- Gas and smoke exhausted from motor vehicles, especially in traffic jams at peak hours.

In general, the island's flushing atmosphere tends to reduce the effect of air pollution problems, some of which blow harmlessly out to sea. The largest area suffering from air pollution (oil refining) is the Marabella-Vistabella area.

3.1.2 Land Pollution

There is widespread littering in communities (e.g. streets, parks, drains, etc.) and along the nation's beaches. There is also considerable dumping of refuse off highways and in coastal waters. Dumping and abandoning of derelict motor vehicles is a special problem in rural areas.

A new Anti-Litter Act incorporates substantial penalties but it is difficult to enforce, requiring that the actual littering act be witnessed by more than one person.

The urban problem of stray and ownerless dogs is only now receiving effective attention (within recent months) by municipalities after years of complaints.

3.1.3 Water Pollution

Rivers: Most of the nation's rivers are polluted to one degree or another by industrial wastewater. This is most apparent in the dry season when river-flows are reduced to a minimum. In the wet season particularly, there is natural pollution by a heavy sediment load from soil erosion and silted run-offs. Pollution from the agricultural run-off of chemicals applied to crops and crop land (e.g. pesticides, fertilizers, etc.) is also suspect.

In the north, running east to west and receiving drainage and wastewaters from the most developed region in Trinidad is the Caroni River which is polluted in its upper stretches by a variety

of industries, in its middle area by sugar and rum refineries, and in its lower region by the tributaries of St. Joseph and San Juan rivers by milk, beer, soap and other industries. The lower Caroni River is the most polluted and it feeds the very important nature reserve called the Caroni Swamp. No measures to prevent and control this pollution have been taken. The proposed Caroni-Arena Water Treatment Plant has been sited as far upstream as Piarco Airport in order to escape the heavy pollution. This cost the country millions of dollars for increased water-transmission costs.

Other rivers are also polluted especially the two southern ones - the Cipero, with sugar refinery wastes and refuse dumping, and the Guaracara which is an open oil sewer.

Marine: The pollution of coastal waters and beaches is caused by:

- Oil from marine oil exploration, ships and natural seepages.
- Refuse and sewage from ships and coastal communities.
- Discharges of polluted rivers.
- Dumping and littering of beaches by fishermen and the public.

A new major threat of marine pollution is the growing practice of ship-to-ship transfer of oil in the Gulf of Paria from super tankers. Although preventive measures are taken, there is no local capability to control a major oil spill if it occurs.

3.2 Food Sanitation

Following typhoid, polio and gastro-enteritis epidemics in recent years, some attention is being given to food sanitation in the more urban areas. Food handlers must be medically certified, and some inspection of the sanitary conditions in eating places and food processing plants is taking place.

Two weak areas remain:

(a) the public's complacency and lack of knowledge of proper food sanitation, and

(b) the inadequacy of inspection staff in the local government councils.

3.3 Environmental Education

The Health Education Units in the Ministry of Health and in the City Council of Port of Spain are both functioning, although with limited budgets; and therefore, on a campaign basis rather than routinely. Because of the local indifference and complacency towards the environment, considerable public education is needed to get the public to participate.

At a meeting earlier this year on the subject of Environmental Education held by the Anti-Pollution Council, it was unanimously agreed that the environmental portion of the Social Studies curriculum in primary and secondary schools should be developed. To this end there is a growing demand for teaching material on the subject.

3.4 Health Situation and Statistics

Attached at Appendices VII and VIII are some basic health statistics. Some conclusions can be drawn, such as:

(a) Cancer and heart diseases are the two leading health problems.

(b) While environmental diseases are generally decreasing, sudden epidemics are possible -

Typhoid in 1969, 1971 and 1972
Diphtheria in 1969
Poliomyelitis in 1971/72
Hookworm in 1970

(c) The two mosquito-borne diseases of malaria and yellow fever are no longer the threat they were, while cholera is still non-existent.

The possibility of a sudden epidemic of one environmental disease or another is proof that environmental control measures are not fully successful, and therefore cannot be relaxed.

A high motor vehicle population on the country's roads, which have not enjoyed a parallel increase in width or number, continues to lead to annual increases in traffic accidents with accompanying deaths and injuries.(See Appendix IX).

3.5 Deficiencies in Government Services

Two deficiencies in government services appear to be the main constraints to the establishment of an all-embracing environmental agency in government.

The first is that there is a general feeling that too many government organizations already exist and that the government pay-roll is already too high. There is therefore an agreed reluctance among policymakers to form a new environmental agency with the trained personnel necessary to implement a national environmental programme.

Secondly, despite the preparation of a national health plan in recent years with PAHO/WHO assistance, there has been no serious progress in the development of the environmental health arm of the Ministry of Health. If such an arm had been fully developed in the past, it would have inevitably become the nucleus for an overall environmental agency, as has happened in a number of countries.

It is a fact that without such an agency to spearhead government's initiative in this area, no serious national environmental programme can be expected.

3.6 Other Problems

Noise Pollution: Noise pollution is developing in the Port-of-Spain area (e.g. motor vehicles, juke-boxes, etc.) but is still far from crisis levels.

Working Environment: The Factory Inspectorate in the Ministry of Labour is responsible for control of the working environment, especially the possibility of industrial accidents (See Appendix X for a recent record). However, it is the routine efforts of the labour unions that have improved working conditions over the years. New legislation is now being considered.

4. ENVIRONMENTAL RESOURCES

4.1 Soil Resources

Appendix XI gives the utilization of the surface areas by Principal Uses of Land (1946-59). About $\frac{1}{3}$ of the entire area of Trinidad & Tobago is classified as Agricultural Areas, and more than $\frac{1}{2}$ is State Forests. In recent years a Land Capability Survey was carried out to determine the agricultural potential of the soils of the country. There appears to be no large scale soil losses, although constant flooding by brackish water (e.g. lower Caroni in the El Socorro area) and poor drainage has ruined small areas here and there. Soil erosion on the hills results from uncontrolled bulldozing by land developers. Beach erosion on the east and north-east coast, open to the North-East Trade winds from across the Atlantic Ocean, requires more attention than has been given so far.

4.2 Water Resources

A Trinidad Water Resources Survey was carried out with bilateral assistance (Canada) during the period July 1966 to December 1969. Among other things the Survey:

- established a hydro-meteorological network,
- collected, analyzed and published hydro-meteorological data,
- established a preliminary assessment of the total exploitable water in Trinidad as 60 mgd groundwater and 240 mgd surface water,
- established that water requirements for Trinidad would approximate 200 mgd in year 2000.

For the time being there appears to be enough water in the country to meet its needs. The major threat to surface water sources is industrial pollution, while salt water infiltration into some wells (e.g. El Socorro) is cause for some concern. A Water Resources Department exists and reports to the Board of the Water and Sewerage Authority.

4.3 Forestry

An old and active Forestry Department controls the orderly removal of timber from the forests in accordance with a planned programme or when clearance for a water reservoir (e.g. Navet Dam) or agriculture is needed. The Department also carries out a successful Reafforestation Programme. At Appendix XII some forestry information is given. Two FAO experts are assisting the department which has posts for 8 professionals. A forestry school trains sub-professional staff members.

4.4 Parks and Beaches

Improved economic conditions in recent years have meant a greater number of citizens looking for recreational outlets and for areas for environmental appreciation. There is a growing demand for national parks, hiking trails, etc. and potential areas do exist. The Caroni Swamp, although not declared a national park, is used by tourists and locals alike; the main attraction being the beautiful red Scarlet Ibis bird which nests there. Meanwhile, despite the lack of facilities public beaches (and all are public) are widely used.

In 1973 a National Environment and Conservation Council was formed to advise the Minister of Planning and Development on the question of parks and beaches. This advisory council has no budget and it lacks the supporting staff for real effectiveness.

Beach erosion and pollution by oil are problems also deserving attention.

4.5 Fisheries and Marine Pollution

Oil is the most important pollutant in the coastal waters, and on beaches on the west, south and east coasts. It is feared that the sediment in Trinidadian waters from the Orinoco River in Venezuela, when mixed with oil (from natural seepages or oil spills) coagulates and settles to the bottom. As a result, over a period of time such a "paving" exercise will lead to the destruction of micro-plankton and the whole aquatic food chain. Bottom grabs by a U.S. Coast Guard

survey ship (1972) showed oil in every sample of seabed collected off the south coast. Meanwhile, the feeling is that the Gulf of Paria has been out-fished. Fish delivered to principal markets runs around 8 to 10 million lbs. annually.

4.6 Other Problems

Flooding: Almost every year the Caroni River floods to the south at Kelly Village in its mid-section. Much of the area is in sugar-cane and the flooding is a temporary inconvenience for households and transportation. Some relief is expected when the Caroni-Arena water supply project starts storing Caroni water in a reservoir on its Arena tributary.

5. NATIONAL POLICIES AFFECTING ENVIRONMENT

5.1 Local Institutions and Legislation

There is no statutory environmental agency responsible for all environmental matters, but the two advisory bodies mentioned previously are worthy of repeating. They are:

(a) Anti-Pollution Council	- All matters relating to the human environment
(b) National Environment and Conservation Council	- Parks and beaches

Executive agencies and their supporting legislation in the environmental field are:

(a) Local Health Authority (municipalities)	- Public Health Ordinance 1917
(b) Factories Division, Ministry of Labour	- Factories Ordinance 1948
(c) Harbour Master, Customs, Marine Police	- Oil in the Waters of the Colony Ordinance
(d) Town and Country Planning Division, Ministry of Planning and Development	- Town and Country Planning Ordinance 1960

(e) Water and Sewerage Authority	- Water and Sewerage Authority Act, 1965
(f) Ministry of Petroleum and Mines	- Petroleum Regulations, 1970
(g) Harbour Master, Customs, Marine Police	- Marine Areas (Preservation and Enhancement) Act, 1970

5.2 Industry and the Environment

There are many direct and indirect features in the relationship between industry and the environment. The most worrisome is environmental pollution - air and water.

5.2.1 Existing Industries

There is a fair amount of pollution from existing industry, especially from wastewater discharge into rivers. The old industries show no interest in the environment, and they are inclined to admit that in the absence of a strong anti-pollution programme by government, they plan to take no corrective action whatsoever. If this inactivity continues any future industrial development will have some serious and harmful environmental side effects.

5.2.2 Industrial Development

The government is currently engaged in a programme of industrial development and diversification with particular emphasis on the development and use of the petroleum resources of the Nation. A recent announcement referred to "the nationalization of Trinidad & Tobago's internal energy policy, the promotion and development of energy-based or energy-intensive industries and the development of infrastructure facilities to serve these industries. Some of the industries planned include petroleum production and refining, iron and steel, aluminium smelting, fertilizer manufacture, shipping and petro-chemicals".

The result of this will be a sharp rise in the water supply demands for the area, as well as the need to carefully assess waste disposal and other inevitable demands on the environment.

A special comment might be made with respect to the tourist industry and Tobago. There is a need for a much greater appreciation in local circles for the importance of the environment in tourism development, bearing in mind that a tourist to a tropical island is more interested in the environment of the sun and the sea than anything else.

5.3 Agriculture

The major environmental problems in agriculture are:

(a) Sugar-cane burning, before canes are reaped, causing air pollution over large areas in the early months of the year; and

(b) aerial spraying of insecticide over the sugar-cane crop to destroy the froghopper insect also destroys bees and other useful insects.

5.4 Public and Political Attitudes

As far as social and civic affairs are concerned, Trinidadians have a reputation for complacency and disinterest. This has probably been inherited from the past when Trinidad experienced years of strong colonial rule and citizens viewed the community as belonging to someone else. As it stands now the average citizen keeps his home clean (though not his backyard) but is prepared to tolerate an unsanitary street or public place; and indeed, he may litter at will.

The result is that there is little public pressure on government to give priority of attention to community sanitation, national parks and other features of the nation's environment. The policymaker therefore continues to be devoted to the energy crisis, industrial development and jobs.

However, an environmental group was formed (by the Consultant) in 1972 called Society for the Conservation, Appreciation and Promotion of the Environment (SCAPE). The Society meets irregularly and lobbies routinely for one environmental cause or another.

5.5 External Assistance

Trinidad & Tobago enjoys a fair measure of assistance from abroad. On a bilateral basis Canada and the U.S.A. are major donors. Otherwise the UNDP and the other UN Agencies assist in various projects from time to time. Many major projects such as water supply, sewerage, housing, etc. are possibly funded by one of the members of the World Bank group. Trinidad's economy is good enough to permit most of the funding to come from government sources.

6. CONCLUSIONS

Trinidad & Tobago, with its colonial background and oil economy seems to be at an intermediate stage in its development. As such she experiences environmental inadequacies like undeveloped governmental services (e.g. poor community maintenance) and a lack of environmental consciousness among members of the public. To these developing country problems however, may be added industrial pollution which is really a problem of development.

There is no doubt that the country badly needs to up-grade its present efforts and establish a modern environmental programme for the nation as a whole. A Resume of the Environmental Situation is given at Appendix XIII.

Appendix I

List of Persons in Contact with Consultant in Trinidad

(1) Anti-Pollution Council members.

(2) National Environment and Conservation members.

(3) SCAPE members (Society for the Conservation, Appreciation and Promotion of the Environment).

(4) Ministry of Health: Minister, Permanent Secretary, Medical Officers, Director of Public Health Engineering Division.

(5) Water and Sewerage Authority: Executive Director, Deputy Executive Director, Technical Director, Projects Manager, etc.

(6) Ministry of Planning & Development: Minister, Director of Town and Country Planning, etc.

(7) Ministry of Agriculture, Lands and Fisheries: Conservator of Forests, Senior Fisheries Officer.

(8) Ministry of Petroleum & Mines: Minister, Permanent Secretary, Special Adviser to Minister, Chief Petroleum Engineer.

(9) Ministry of Local Government: Minister.

(10) Industrial Development Corporation: Deputy Chairman, General Manager, Projects Manager.

(11) Ministry of Works: Chief Technical Officer, Director of Drainage.

(12) Association of Professional Engineers of Trinidad & Tobago.

Appendix II

List of Reference Documents for Trinidad & Tobago

(1) Annual Statistical Digest - Central Statistical Office 1971/72.

(2) Interim Report of the Anti-Pollution Council (September 1973).

(3) Trinidad & Tobago Water Study (September 1970).

(4) Land Capability Survey.

(5) Trinidad Water Resources Survey (1966-69).

(6) Trinidad Rainfall, 1933-52 - L. Wehekind.

(7) Report on Sewerage Facilities (September 1968).

(8) Final Report of the Committee appointed by the Prime Minister to consider the problems posed by Industrial Wastes in Trinidad & Tobago (March 1972).

(9) Report of the Committee appointed by Cabinet to consider the question of Pollution (September 1971).

*(10) SCAPE pamphlet on "aims and objects, methods, interest and fees".

*(11) Trinidad & Tobago: Thoughts on our Environment.

(12) Report of the Water Pollution Committee (1960).

*(13) Miscellaneous papers and extracts.

Note: * means document submitted.

AREA, LOCATION AND CLIMATE

TABLE 1

Area and Location

The Island of Trinidad is situated about 10 degrees North of the Equator, between 61 and 62 degrees West Longtitude in the Southern part of the Caribbean Sea. It is seven miles from the Venezuelan Coast from which it is separated by the Gulf of Paria and the narrow channels of the Bocas. It is the second largest of the group formerly comprising the British West Indian islands and is about 65 miles long and 48 miles broad with an area of 1,863 square miles. This island is mostly flat, with its highest peaks in the North; Aripo the highest, is 3,085 feet.

The Island of Tobago is situated about 11 degrees 9 minutes North of the Equator, 60 degrees 43 minutes West Longtitude. It lies north-east of Trinidad from which it is separated by a channel about 19 miles wide. It is about 32 miles long and 11 miles broad with an area of 116 square miles. The topography is broken with a central chain of peaks, the main ridge reaching a height of 1,800 feet.

Administrative Divisions	Area		1960 POP. CENSUS
	Acres	Square Miles	
	(1)	(2)	(3)
Trinidad and Tobago	1,267,236	1,980.0	827,957
Port of Spain	2,368	3.7	93,954
San Fernando	1,600	2.5	39,830
Arima	582	0.9	10,982
St. George[1]	226,659	354.2	256,478
St. Andrew	180,954	282.7	32,590
Caroni	136,951	214.0	90,513
Victoria[2]	201,011	314.1	132,721
St. Patrick	166,912	260.8	108,218
St. David	50,530	79.0	6,032
Nariva	132,033	206.3	17,226
Mayaro	93,244	145.7	6,080
Tobago	74,392	116.2	33,333
Waters of the Territory	...	...	...

[1] Excludes Port of Spain and Arima.

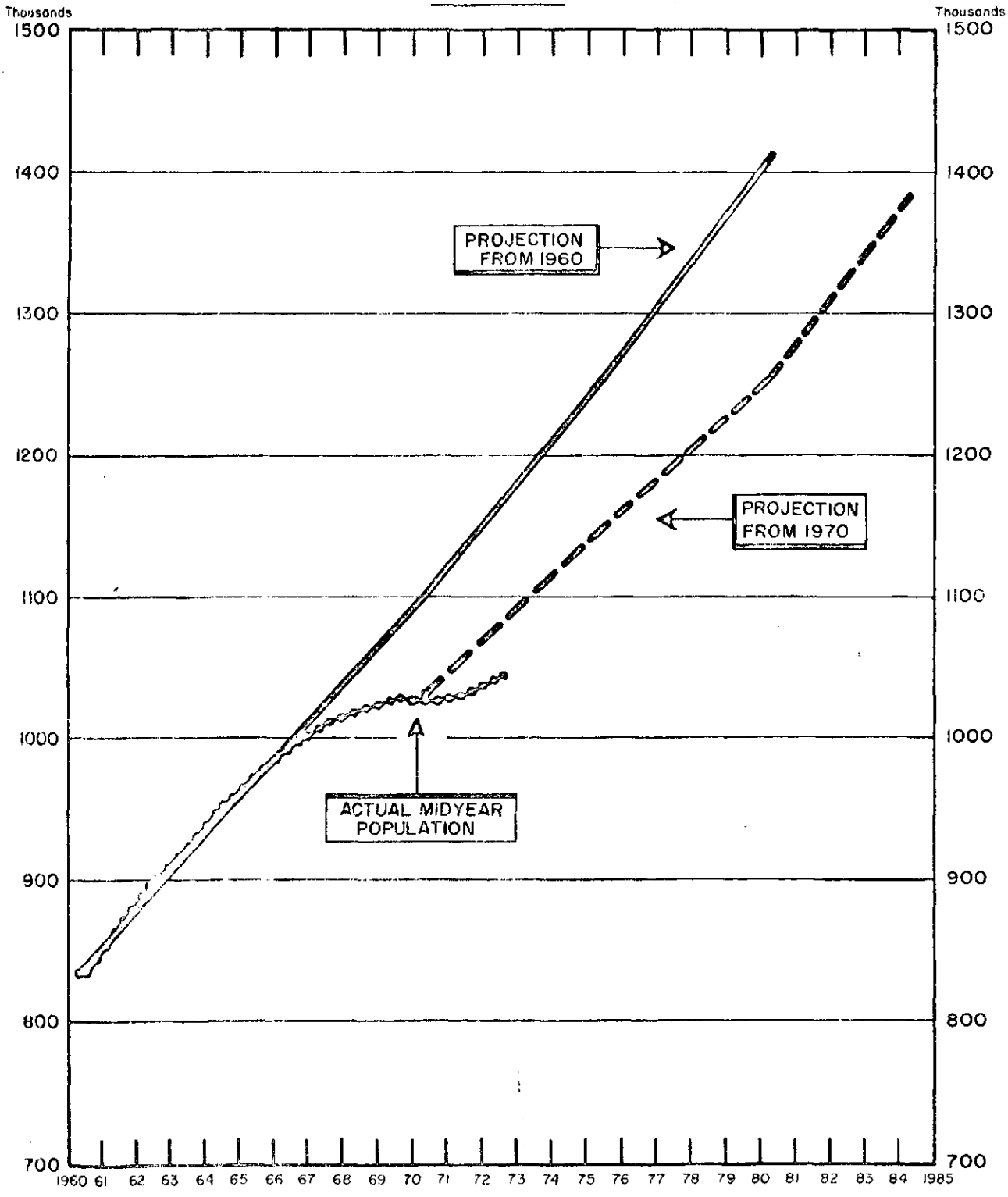
[2] [illegible]

Sources: 1

APPENDIX IV

Chart 3

POPULATION PROJECTIONS AND ACTUAL POPULATION GROWTH 1960—1985



See table 21

APPENDIX V

TABLE 205. ANALYSIS OF SUPPLY AND DISTRIBUTION OF WATER, 1960 – 1965

000 gals

Year	Supply		Distribution						
	Works and Hydraulics Department	Arima Borough Council	To Consumers in distribution area		To Municipalities			To consumers outside distribution areas	Other[1]
			Metered	Unmetered	Port of Spain City Council	San Fernando Borough Council	Arima Borough Council		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1960	7,706,503	532	764,598	5,356,805	507,666	672,391	148,065	257,510	
1961	8,751,800	447	703,558	6,228,676	742,693	595,796	176,495	305,259	
1962[2]	10,565,455	739	792,935	7,636,280	843,461	781,628	239,614	272,276	
1963	12,103,708	776	812,275	8,909,142	809,161	938,339	256,827	278,740	
1964	13,230,644	813	831,615	9,793,401	1,084,715	938,083	278,482	305,161	
1965	...	...	852,405	10,772,741[3]	1,878,544	703,798	245,700	346,495	

[1]Includes bulk supplies to shipping, to Wardens, for distribution by Lorries, to Trinidad Leaseholds Ltd., to Trinidad Cement Ltd., and to Federation Chemicals Ltd.

[2]Since 1961 there has been a rapid expansion in C.W.D.A. activity. In addition certain revisions were made in the accounting basis; hence data for 1961 onwards may not be strictly comparable with those for previous years.

[3]The Municipalities of San Fernando and Arima were billed only up to September, 1965.

Source: 83

TABLE 206. ESTIMATE OF WATER PRODUCTION OF THE WATER AND SEWERAGE AUTHORITY, 1965–1972

million galls.

Year	Total Production	Average Daily Production
	(1)	(2)
1965	...	...
1966	17,556.5	48.1
1967	17,998.5	50.7
1968	19,800.6	54.1
1969	20,483.5	57.7
1970	20,838.5	58.7
1971	21,158.0	59.6
1972	22,801.8	62.3

Source: 94

Appendix VI

ANTI-POLLUTION COUNCIL

The Terms of Reference of the Anti-Pollution Council are:

i) to advise the Minister of Health on all matters relating to the Human Environment;

ii) to identify, investigate and make recommendations for the improvement and maintenance of a healthy environment;

iii) to make recommendations with a view to ensuring that, as far as possible pollution controls are designed and implemented simultaneously with industrial development; and that rivers, watercourses and beaches are kept unpolluted and their full recreational and aesthetic value is preserved at all times;

iv) to recommend such legislation as will prevent further deterioration on the environment with the consequent debasement of the quality of life of the people of Trinidad and Tobago;

v) to study and make recommendations as to the possible effects of environmental influences, such as accelerated transportation and communication, and the stress and pressures of modern life on mental health and cultural and social patterns in the country;

vi) to appoint committees chaired by one of its members and comprised of members and/or non-members who may be drawn from the general public or from any Ministry of Government as may be appropriate.

Membership of the Council is as follows:

Mr. Ronald Williams - CHAIRMAN
Chief Engineer
Trintoplan

Mr. Ken Snaggs Director Town & Country Planning	-	MEMBER
Mr. Dudley Isac Public Health Engineer Ministry of Health	-	do.
Mr. Hugh Hinds Chief Petroleum Engineer Ministry of Petroleum and Mines	-	do.
Dr. Alejandro Santiago Public Health Medical Officer Ministry of Health	-	do.
Dr. Michael Lines Deputy Chief Chemist/ Assistant Food & Drugs Director Ministry of Health	-	do.
Dr. John Spence Biologist University of the West Indies	-	do.
Dr. Edmund Jones Technical Officer (Extension) Ministry of Agriculture, Lands and Fisheries	-	do.
Mr. Clem Razack Lawyer	-	do.
Mr. Colin Taylor Director of Drainage Ministry of Works	-	do.
Mrs. Hazel Mutunhu MSc. (Marine Biology)	-	do.

TABLE 26. DEATHS AND DEATH RATES BY 50 CAUSE – GROUPS, 1969–1971
(RATES PER 100,000 ESTIMATED MID-YEAR POPULATION)

Abbreviated List No.[1]	Cause of Death	Deaths			Rates		
		1969	1970	1971	1969	1970	1971
	Total (all causes)	7,068	6,956	7,044	687.68	677.48	682.25
B 1	Cholera	–	–	–	–	–	–
B 2	Typhoid fever	3	4	–	0.29	0.39	–
B 3	Biscillary Dysentry and Amoebiasis	5	4	2	0.49	0.39	0.19
B 4	Enteritis and other Diarrhoel diseases	257	236	274	25.00	22.98	26.54
B 5	Tuberculosis of respiratory system	40	42	53	3.89	4.09	5.13
B 6	Other Tuberculosis including late effects	1	2	3	0.10	0.19	0.29
B 7	Plague	–	–	–	–	–	–
B 8	Diptheria	3	3	1	0.29	0.29	0.10
B 9	Whooping cough	–	–	–	–	–	–
B 10	Streptococcal sore throat and Scarlet fever	–	–	–	–	–	–
B 11	Meningococcal infections	–	2	1	–	0.19	0.10
B 12	Acute Poliomyelitis	–	–	2	–	–	0.19
B 13	Small pox	–	–	–	–	–	–
B 14	Measles	–	1	2	–	0.10	0.19
B 15	Typhus and other Rickettsioses	–	–	–	–	–	–
B 16	Malaria	–	–	–	–	–	–
B 17	Syphillis and its Sequelae	3	1	2	0.29	0.10	0.19
B 18	All other infective and parastic diseases	120	90	64	11.68	8.72	6.20
B 19	Malignant neoplasms, including neoplasms of lymphatic and haematopoietic tissues	635	674	648	61.78	65.62	62.76
B 20	Benign Neoplasms of unspecified nature	22	19	28	2.14	1.85	2.71
B 21	Diabetes mellitu	197	279	390	19.17	27.17	37.77
B 22	Ayitaminosis and other Nutritional deficiency	153	143	105	14.89	13.68	10.17
B 23	Anaemias	58	67	77	5.64	6.52	7.46
B 24	Meningitis	16	20	26	1.65	1.95	2.52
B 25	Active Pheumatic fever	1	2	4	0.10	0.19	0.39
B 26	Chronic rheumatic heart disease	71	70	73	6.91	6.82	7.07
B 27	Hypertensive Disease	342	340	337	33.27	33.11	32.64
B 28	Ischaemic Heart Disease	766	897	905	74.53	87.36	87.65
B 29	Other forms of heart disease	550	544	466	53.57	52.98	45.13
B 30	Cerebrovascular Disease	990	950	876	96.32	92.52	84.84
B 31	Influenza	12	4	17	1.17	0.39	1.65
B 32	Pneumonia	352	330	389	34.25	32.12	37.68
B 33	Bronchitis, Empysema and Asthma	107	100	164	10.40	9.74	15.88
B 34	Peptic Ulcer	36	49	37	3.50	4.77	3.58
B 35	Appendicitis	3	6	9	0.29	0.58	0.87
B 36	Intestinal obstruction and hernia	37	31	28	3.60	3.02	2.71

TABLE 26. DEATHS AND DEATH RATES BY 50 CAUSE - GROUPS, 1969–1971
(RATES PER 100,000 ESTIMATED MID-YEAR POPULATION) – Concluded

Abbreviated List No.[1]	Cause of Death	Deaths			Rates		
		1969	1970	1971	1969	1970	1971
B 37	Cirrhosis of liver	115	125	139	11.19	12.17	13.46
B 38	Nephritis and nephrosis	61	47	63	5.93	4.58	6.10
B 39	Hyperplasia of prostate	22	13	17	2.14	1.27	1.65
B 40	Abortion	23	17	18	92.07	68.05	69.46
B 41	Other Complications of pregnancy, childbirth and the puerpertium. Delivery without mention of complication	26	17	20	108.13	68.05	77.18
B 42	Congenital Anomalies	94	96	88	374.05	381.69	33.70
B 43	Birth Injury, Difficult Labour and other Ranoxic and Hypoxic conditions	108	95	72	429.72	377.72	275.69
B 44	Other causes of Perinatal Mortality	372	264	220	1,480.30	1,049.66	842.40
B 45	Symptoms and Ill-defined conditions	404	304	327	39.31	29.60	31.67
B 46	All other diseases	581	521	614	56.53	50.74	59.47
B 47	Motor vehicle accidents	161	185	165	15.66	18.02	15.98
B 48	All other accidents	187	217	212	18.19	21.13	20.53
B 49	Suicide and self-inflicted injury	58	90	50	5.64	8.72	4.84
B 50	All other external causes	76	55	55	7.40	5.35	5.33

[1]The Abbreviated Lists of 50 Causes for Tabulation of Mortality adopted by the World Health Organisation in 1965. Vide Eighth (1968), Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death - Volume 1 pages 445 – 446.

Source: 10

TABLE 68. NOTIFIABLE INFECTIOUS AND OTHER COMMUNICABLE DISEASES BY NUMBER OF CASES REPORTED, 1962 – 1972

Year	Infectious Diseases										
	Enteric Fever	Pneumonia	Tuberculosis	Diphtheria	Ophthalmia Neonatorum	Chicken Pox	Acute Ant. Poliomyelitis	Puerperal Pyrexia	Cerebro-Spinal Fever	Encephalitis	Yellow Fever
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1962	84	69	398	56	32	1,370	12	11	3	–	–
1963	62	94	384	70	49	506	15	7	–	–	–
1964	42	139	312	67	29	399	4	7	3	6	–
1965	11	45	135	74	14	417	–	–	–	–	–
1966	39	80	420	33	42	124	1	2	–	–	–
1967	23	39	188	18	7	75	3	6	2	–	–
1968	69	47	238	65	4	353	1	1	1	–	–
1969	108	302	185	180	46	342	9	10	–	7	–
1970	56	194	120	48	36	135	3	11	5	2	–
1971	139	208	139	65	18	42	46[2]	7	4	6	–
1972	139	208	116	79	66	219	140	7	–	–	–

Year	Other Communicable Diseases					
	Malaria	Dysentery	Influenza	Ankylostomiasis[1]	Whooping Cough	Measles
	(12)	(13)	(14)	(15)	(16)	(17)
1962	–	1,598	8,851	847	632	150
1963	–	1,487	4,377	567	849	2,799
1964	4	1,902	4,303	187	221	285
1965	–	1,521	5,819	196	424	193
1966	–	1,176	2,923	196	233	172
1967	–	809	2,366	4	227	752
1968	5	684	7,022	25	332	372
1969	6	896	9,028	108	672	706
1970	1	348	6,278	555	210	756
1971	3	163	3,667	240	57	576
1972	2	230	4,027	243	111	172

[1]These figures relate to actual cases of Ankylostomiasis (Hookworm Disease).

[2]46 cases of poliomyelitis reported for 1971 are part of an outbreak which continued to March 1972.

Source: 23

TABLE 94. MILEAGE AND EXPENDITURE OF PUBLIC ROADS IN TRINIDAD AND TOBAGO, 1961 – 1972

Year	Existing Miles of Roads			Expenditure		
	Main[1] roads	Local[2] roads	Total (all roads)	Maintenance (all roads)		New Capital Works (all roads)
				Total $ 000	Per mile $	$ 000
	(1)	(2)	(3)	(4)	(5)	(6)
1961	1,428	1,099	2,527	6,344	2,510	4,789
1962	1,249	1,144	2,393	6,789	2,837	3,189
1963	1,249	1,128	2,377	6,040	2,541	2,923
1964	1,252	1,131	2,383	9,103	3,820	6,649
1965	1,252	1,240	2,492	9,126	3,662	4,308
1966	1,252	1,352	2,604	9,630	3,698	7,509
1967	1,252	1,289	2,541	9,040	3,558	3,770
1968	1,258	2,252	4,510	10,797	2,394	1,689
1969	1,258	2,565	...	8,368	...	1,058[3]
1970	1,734	2,601	...	8,598	...	642[3]
1971	1,754	...	...	...	...	...
1972	...	...	...	...	...	...

[1]Maintained by Works Department.

[2]Maintained by Ministry of Local Government.

[3]Data received from Ministry of Local Government.

Source: 32

TABLE 95. PERSONS KILLED AND INJURED IN ROAD ACCIDENTS BY AGE GROUP 1962–1972

Year	Under 5 years		Between 5 and 14 years		Between 15 and 50 years		Over 50 years		Total		
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed and Injured
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1962	8	98	26	773	77	2,508	26	290	137	3,669	3,806
1963	6	114	30	799	64	2,547	39	294	139	3,705	3,844
1964	5	154	23	847	77	2,824	29	297	134	4,112	4,246
1965	9	153	22	941	77	2,921	37	341	145	4,355	4,500
1966	11	156	19	883	74	2,847	39	327	143	4,213	4,356
1967	3	156	23	982	98	2,859	35	364	149	4,361	4,510
1968	6	176	17	881	86	2,724	36	303	139	4,081	4,220
1969	6	157	35	980	96	3,132	48	325	185	4,594	4,779
1970	9	217	26	922	110	3,030	35	391	179	4,630	4,809
1971	8	164	19	819	105	3,341	56	409	188	4,728	4,916
1972	4	157	31	1,059	116	3,458	58	389	209	5,063	5,272

Source: 29

TABLE 54. INDUSTRIAL ACCIDENTS BY CAUSE 1962–1972

Year	Machinery moved by mechanical power	Machinery not moved by mechanical power	Transport	Electricity	Fire, etc.	Use of hand tool	Struck by falling body	Person falling	Stepping on or striking against object	Handling goods or articles	Other	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1962 Fatal ...	–	–	–	1	–	–	2	3	–	–	–	6
Non-fatal ...	57	19	49	4	172	98	214	297	189	254	323	1,676
1963 Fatal ...	..	–	2	1	2	–	–	3	1	–	5	14
Non-fatal ...	60	26	42	1	295	130	207	279	187	322	174	1,722
1964 Fatal ...	–	–	1	1	1	–	1	1	–	–	–	5
Non-fatal ...	82	8	48	10	180	145	240	258	178	252	212	1,713
1965 Fatal ...	–	–	–	–	2	–	2	7	–	–	1	6
Non-fatal ...	80	19	41	4	236	114	203	258	189	382	241	1,767
1966 Fatal ...	–	–	–	–	2	–	1	2	–	–	2	7
Non-fatal ...	78	48	21	1	171	95	238	199	219	274	141	1,478
1967 Fatal ...	–	–	–	1	3	–	2	2	–	–	1	9
Non-fatal ...	67	19	9	3	154	91	191	263	186	282	136	1,391
1968 Fatal ...	–	–	–	–	–	–	–	3	–	–	3	6
Non-fatal ...	85	20	22	4	206	115	171	293	202	317	82	1,517
1969 Fatal ...	–	–	–	1	–	–	3	1	–	1	–	6
Non-fatal ...	65	24	31	6	192	102	188	343	189	320	115	1,594
1970 Fatal ...	1	–	1	–	–	1	2	–	–	–	1	6
Non-fatal ...	100	8	49	8	185	156	184	238	165	324	143	1,560
1971 Fatal ...	1	–	1	–	–	–	2	–	–	–	–	4
Non-fatal ...	65	19	44	16	222	93	198	302	197	285	185	1,620
1972 Fatal ...												
Non-fatal ...												

[1] Accidents refer to those which occur on the premises covered by the Factories Ordinance Ch. 30 No. 2, and which are fatal or disable the worker for more than three days from earning full wages for the work at which he was employed.

Source: 19

TABLE 125. UTILIZATION OF THE SURFACE AREAS[1] BY PRINCIPAL USES OF LAND, 1946 – 1959

	1946	1952	1953	1954	1955	1956	1957	1958	1959[4]
	Acres								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Non-Agricultural Areas									
Residential and Industrial ...	25,000	28,600							
Roads, Traces and Railways ...	19,050	19,150							
Public buildings, Parks, Cemeteries, Schools, etc. (including non-forest areas of the U.S. Bases)	48,200	48,550	97,250	97,250	97,250	97,250	97,250	97,250	97,250
Swamps (not included in forest areas) and Inland water	26,300	26,300	26,300	26,300	26,300	26,300	26,300	26,300	26,300
State Forests:									
Production Reserves ...	43,250	43,200	49,700						
Protection Reserves	165,450	164,950	164,950	284,850	285,800	285,800	285,800	318,525	328,000
Other State Forests	342,750	344,100	337,400	267,200	266,300	266,300	263,200	230,475	216,000
Private Forests	25,800	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000
Abandoned tree crops, bush and secondary growth	135,100	127,000	126,650	124,650	124,650	124,650	124,650	124,650	124,650
Total Non-Agricultural Areas	830,900	827,250	827,250	826,250	826,250	826,250	823,200	823,200	818,700
Agricultural Areas									
Area in cultivation ...	288,600	31[illegible]000	310,000	310,500	310,500	327,200	330,200	330,200	330,200
Pastures	13,600	1[illegible]000	15,000	15,000	15,000	14,400	14,400	14,400	14,400
Semi-derelict crops and shifting cultivation ...	134,150	11[illegible]000	115,000	115,000	115,000	80,550	99,450	99,450	99,450
Total Agricultural Areas	436,350	440,000	440,000	440,500	440,500	422,150	444,050	444,050	444,050
Total Area of Trinidad and Tobago	1,267,250	1,267,250	1,267,250	1,267,250	1,267,250	1,267,250	1,267,250	1,267,250	1,267,250
Of which leased for:									
Oil Mining									
Crown lands (including forests)	155,161	1[illegible]87,3	2[illegible]3,3[illegible]	315,627	3[illegible]7,3[illegible]	3[illegible]7,3[illegible]	[illegible]3,699	362,128	326,669
Alienated Lands[2]	56,189	[illegible]	9[illegible]	136,[illegible]30	1[illegible]4,[illegible]7	[illegible]3[illegible]10	[illegible]1[illegible]91[illegible]	116,0[illegible]5	[illegible]8[illegible]50
Oil exploration[3] –									
Crown lands (including forests)	137,8[illegible]	83[illegible]	2[illegible]95[illegible]	89,[illegible]32	81,5[illegible]4[illegible]	1[illegible],[illegible]7[illegible]	6[illegible]1[illegible]		

[1]Tentative estimates based on [illegible]

[2]Crown lands which have been [illegible]

[3]Oil exploration leases are issued only [illegible] lands.

[4]The latest available information [illegible]

Source: [illegible]

TABLE 147. FOREST OUT-TURN BY TYPE OF TIMBER 1962 – 1971

000 True Cubic Feet

Year	Saw Logs				Fuel Natural Forest	Poles Plantations (Teak)	F.R. and C.L. Total	Grand Total
	Natural Forest	Plantation (Teak)	Private Class 1	Total				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1962	2,866	56	430	3,352	715	78	3,715	4,145
1963	2,394	53	405	2,852	716	53	3,216	3,621
1964	2,624	53	430	3,107	560	53	3,390	3,720
1965	2,845	72	254	3,171	594	61	3,572	3,826
1966	2,565	49	380	2,994	481	51	3,146	3,526
1967	2,512	79	350	2,941	560	57	3,208	3,558
1968	2,236	94	365	2,695	402	124	2,856	3,221
1969	2,000	109	300	2,409	...	88	-	...
1970	2,106	81	250	2,437	...	130	–	...
1971	1,778	83	283[1]	2,144	54	85	2,000	2,283

Source: 52

TABLE 148. MANAGEMENT AND FINANCIAL STATUS OF NATIONAL FORESTS, 1962 – 1971

Year	Production Reserve	Protection Reserve	Unreserved	Administered Government	Leased to U.S.	Management Status			Total Sales of Forest Produce from National Forests	Total Expenditure on National Forests
						Managed by Working Plans	Controlled Exploitation	Other Forest		
	000 Acres								$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1961	332.2	–[1]	211.9	544.1	11.5	199.6	–[1]	344.5	427,252	1,024,740
1962[2]	334.1	20	200.0	554.1	11.5	199.6	308	46.5	351,528	786,894
1963	334.1	20	200.0	554.1	11.5	199.6	308	46.5	386,876	773,791
1964	334.1	20	200.0	554.1	11.5	199.6	307	46.5	422,124	1,219,493
1965	334.1	20	200.0	554.1	11.5	199.6	306	46.5	402,285	1,143,405
1966	334.1	20	200.0	554.1	1.0	199.6	305	46.5	424,110	1,105,299
1967	334.1	20	200.0	554.1	1.0	199.6	304	46.5	641,936	1,549,588
1968	334.1	20	200.0	554.1	1.0	199.6	304	46.5	572,761	1,820,210
1969	332.4	20	194.8	547.2	1.0	197.9	303	46.5	612,067	1,911,829
1970	296.2	36	226.6	558.8	1.0	197.6	303	46.5	632.039	1,141,610
1971	288.7	36	226.6	551.3	–	197.6	307	46.5	356,322	2,232,754

[1]Figures for these years were undertermined.

[2]From 1962 figures for columns 2, 7 and 8 were estimated.

TABLE 149. AREA OF NATIONAL FOREST REGENERATED 1962 – 1971

Acres

Year	Plantation		Regeneration			Total
	Teak	Pine	Intensive		Extensive	
			Natural	Mixed	Natural	
	(1)	(2)	(3)	(4)	(5)	(6)
1962	670	430	460	[illegible]	660	2,420
1963	680	370	380	70	660	2,150
1964	680	760	200	80	660	2,390
1965	700	910	200	80	660	2,550
1966	700	1,040	200	40	200	2,180
1967	680	390	–	60	200	1,330
1968	710	970	–	50	200	1,930
1969	660	590		30	200	1,480
1970	650	1,080	–	40	200	1,980
1971	580	72		30	200	1,530

Source 52

Resume of Environmental Situation - TRINIDAD & TOBAGO

Capacity of Response / Major Problems	Perception	Analysis	Power of Decision	Instruments of Action		
				Legislation	Executive Organization	Human Resources
(1) HUMAN SETTLEMENTS						
(a) Water Supply Quantity	Yes	Yes	Yes	Water & Sewerage Authority Act, 1965	Water & Sewerage Authority	Adequate
(b) Refuse Disposal	No	No	Yes	Public Health Ordinance, 1917	Municipalities and Refuse Disposal Authority	No Professionals
(c) Slums and squatting areas	Yes	No	Yes	Town and Country Planning Ordinances, 1960	Town and Country Planning Department and Urban Redevelopment Council	Limited
(2) ENVIRONMENTAL HEALTH						
(a) River Pollution	Yes	No	Yes	Public Health, WASA and other ordinances	Ministry of Health, Water & Sewerage Authority	Limited
(b) Refuse dumping and littering	Yes	No	Yes	Public Health Ordinance 1917	Municipalities	Limited
(c) Marine pollution	No	No	Yes	Oil in the Waters of the Colony Ordinance	Harbour Master's Office Marine Police	Very Limited
(d) Food Sanitation	Yes	Yes	Yes	Public Health Ordinance, 1917	Municipalities	Limited

Capacity of Response / Major Problems	Perception	Analysis	Power of Decision	Instruments of Action		
				Legislation	Executive Organization	Human Resources
(e) Environmental education	No	No	Yes	Public Health Ordinance, 1917	Health Education Unit Ministry of Health	Limited
(f) Traffic accidents	Yes	Yes	Yes		Ministry of Works	Adequate
(3) NATURAL RESOURCES						
(a) Soil and Beach erosion	Yes	No	Yes	Town and Country Planning Ordinance, 1960	Ministry of Planning & Development	Limited
(b) Fishing depredation	Yes	No	No	Nil	Ministry of Agriculture, Lands & Fisheries	Nil